Heating and Ventilating

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning

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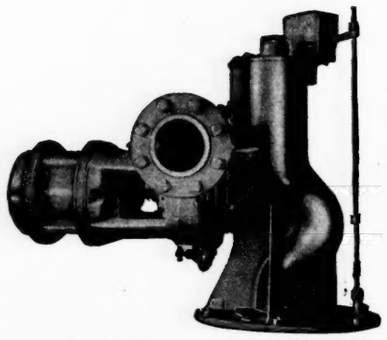

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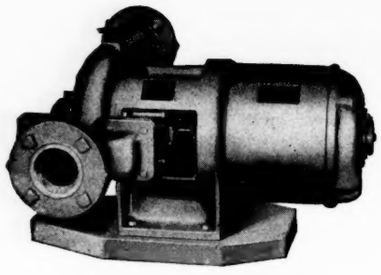

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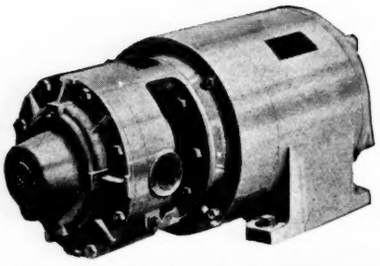

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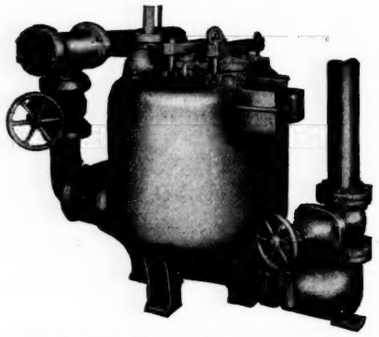

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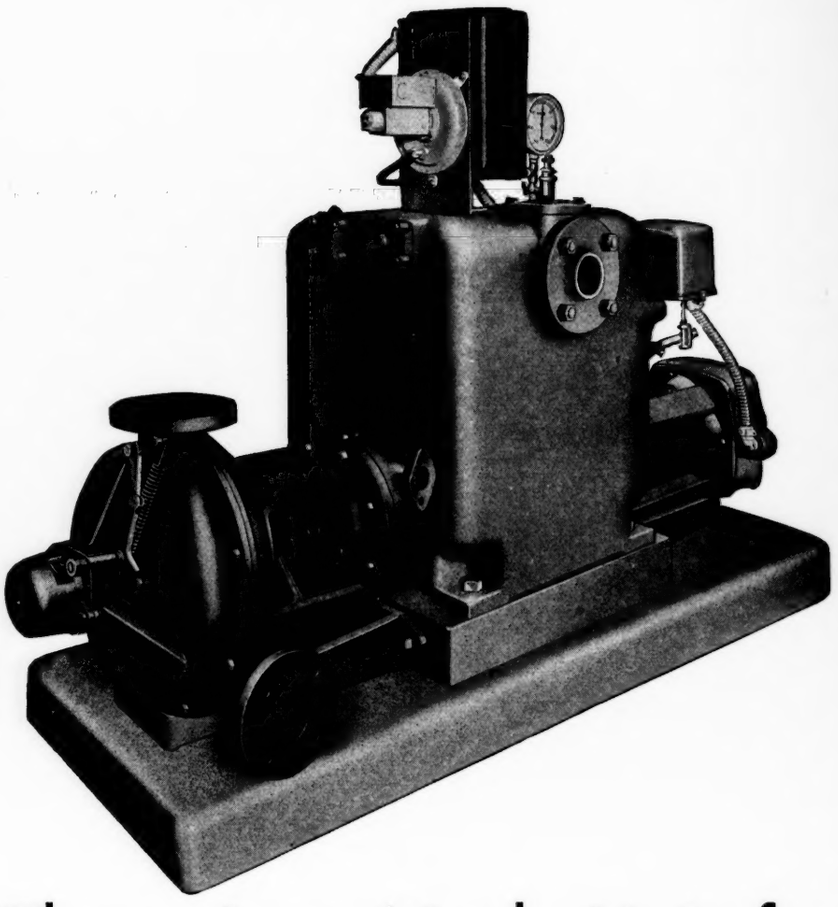

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NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Buildings like these are a market for central heating and house tenants most of whom never before lived in central-heated dwellings. This one is the Techwood project in Atlanta, for which PWA allotted $2.7 million.

Government-Financed Large Scale Housing—A Market for Heating

ACCORDING to present trends it seems that the heating engineer and contractor will find his business in the future—to some extent at least—from different types of buildings than has been the case during the past decade. Part of this shift in building is due to governmental activities.

The national government is at the present time engaged in five quite separate and distinct methods of stimulating the construction industry. These are (1) encouraging the use of private capital in modernizing buildings through loans insured by the Federal Housing Administration. With these activities our readers are well acquainted[1]; (2) insuring loans made by private capital for new residential building construction under Title II of the National Housing Act, administered by the FHA[2]; (3) establishment of national mortgage associations to loan money for new residential building, a move as yet not under way; (4) loaning money for subsistence homesteads[3]; (5) loaning of Federal funds for public works projects, which includes large scale housing projects.[4]

Apparently the government has four objectives in financing large scale housing. In the first place probably the major aim is to increase employment, and secondly, and more or less interlocked with the first, to increase the business done by the capital goods industries, and third, to demonstrate how appalling conditions in the slums of the large cities can be corrected. Fourth, in providing low rent housing for wage earners.

One difficulty in connection with the clearing away of slums is that the land often has a high value and private capital cannot afford to construct a new apartment house or houses on this land, since the return would be insufficient. Consequently, the study of housing conducted in this and other countries for many years was practically that and nothing more. That is, they never got much past the study stage. However, with public financing large scale housing has become a reality, not only in this country but in most of the European countries.

The idea of low-cost, large scale housing is not a new one, but never before received such wide publicity as it has since the government has begun actively to support such projects. However, the government has been directly concerned with housing before. During the War two agencies were engaged in constructing housing.[5] Then the need was for housing for workers in

[1]Current activities of FHA are described in an article in the Modernizing Section of this issue.

[2]See "Title II of Housing Act Launched," HEATING AND VENTILATING, December, 1934, page 34.

[3]Described in the December, 1934 issue of HEATING AND VENTILATING, page 41—"Subsistence Homesteads: A Government Activity."

[4]Another government activity is the Real Property Inventory, which showed the condition of housing in 64 cities. See HEATING AND VENTILATING, November, 1934, page 30, "53.8% of Urban Residential Structures Have Central Heat."

[5]The Emergency Fleet Corporation and the U. S. Housing Corporation.

SUMMARY OF INFORMATION ON HOUSING PROJECTS UNDER CONSTRUCTION AND FINANCED WHOLLY OR IN PART BY FEDERAL FUNDS

Federal Projects

City	Project	Cost, $	Per Cent Completed	Type of Building	Heating	No. of Family Units
New York	Williamsburg	12 Million	Land Being Purchased	—	Not Yet Determined	2500
Chicago	70 Blocks, North Side	12.5 Million	Condemnation Started	Mostly Row Houses	Not Yet Determined	2500
Chicago	37 Blocks, Southwest	12.5 Million	Condemnation Started	—	Not Yet Determined	3000
Chicago	South Park Gardens	7 Million	Condemnation Started	3-Story Apartments	Not Yet Determined	1400
Atlanta	Techwood	2.7 Million	Contract Let	3-Story Dormitory and 2- and 3-Story Apts.	Zone Controlled Vacuum System. City Steam	603
Atlanta	University	2.1 Million	Contract Open	2- and 3-Story Flats and Row Houses	Zone Controlled Vacuum System. Central Plant	617
Cleveland	Cedar-Central	3 Million	Demolition Started	3-Story Apartments	Not Yet Determined	799
Indianapolis	—	3 Million	Demolition Started	1-, 2- and 3-Story Flats and Apartments	Not Yet Determined	1044
Cincinnati	—	6 Million	Land Being Acquired	—	Not Yet Determined	1950
Detroit	—	6 Million	Land Being Acquired	—	Not Yet Determined	—
Montgomery	—	320,000	Demolition Completed	Row Houses	Not Yet Determined	160
Cleveland	Outhwaite	2.8 Million	Condemnation Started	—	Not Yet Determined	635
Louisville	—	1.6 Million	Condemnation Started	Apt. and Row Houses	Not Yet Determined	400

Limited Dividend Projects

New York	Hillside	5.7 Million	46%	Apartments, Up To 6-Story	Oil Burning Plants (5). Zone Controlled Vacuum System	1388
New York	Boulevard Gardens	4.1 Million	33%	Apartments, Up To 6-Story	Automatic Oil Burning Plants (10). Low Pressure Steam	957
Philadelphia	Juniata Park	1.2 Million	85%	3-Story Apartments	Oil-Fired Plant (1), Vacuum System	284
St. Louis	Neighborhood Gardens	730,000	12%	Apartments	Oil-Fired Plants (3), Vacuum System	252
Alta Vista, Va.	Alta Vista	100,000	Completed	Houses	Single Units	50
Euclid, Ohio	Euclid	—	—	Houses	Mostly Warm Air	—
Raleigh, N. C.	Boylan	233,600	0	Houses	Mostly Warm Air	54
New York	Knickerbocker Village	9.5 Million	95%	Apartments	Oil-Fired Central Plant, 3 Boilers; Zoned Control of Two Pipe Gravity Return Steam System	1592
New York	Brooklyn Polytechnic	2.1 Million	—	Apartments	Not Yet Determined	450

districts where there were insufficient dwelling facilities. Now the need is for houses to replace socially undesirable buildings in large cities and to provide healthier and more adequate living for the lowest paid part of the population.

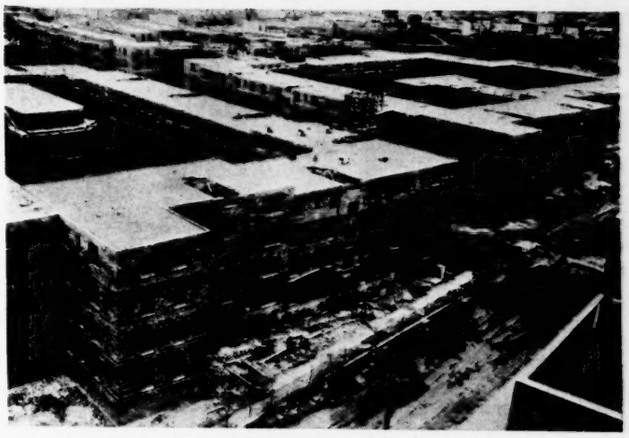
This demand has, of course, existed for many years, but, as previously mentioned, private capital has been unable to supply such housing. Some states, however, notably New York, during the last decade passed legislation providing for the so-called limited dividend housing. Under these laws, the state subsidizes such developments by advancing money for their building, and exempts them from tax, providing that the private capital invested, amounting to not less than a third of the total cost, shall receive not more than a certain fixed rate of interest.[6]

At the beginning of the Public Works program an effort was made to stimulate building and provide such housing by using the limited dividend idea, with Federal instead of state aid. Under this arrangement, the now-occupied Knickerbocker Village in New York, the Hillside development in New York, and a number of other projects, most of which are still under construction, were promoted. However, for various reasons, PWA has finally turned more to the plan of outright direct financing and construction.

Large scale housing is taking the form of both apartments and row houses. Planning, design, and building are, in almost all cases, being handled by private architects, engineers, and contractors. In regard to the heating the designers have not, as might have been supposed, turned to the cheapest in first cost (say stoves), but have taken a long range view with due consideration to proper heat distribution and operating costs, so that we find the apartments (that is, those far enough along for the heating to have been decided on) heated by oil-fired plants, with steam systems and zone control.

The accompanying table summarizes the available data on housing projects now under way, divided into the limited dividend group and those financed directly by Federal funds. It will be noted that the total number of families provided for is quite large, with a potential population of these buildings probably totaling about 50,000.

[6]Among projects so financed from 1920-30 were the Metropolitan Life Insurance project in New York; Sunnyside Gardens in Queens, and others.



A view of the Hillside housing project in the Bronx, New York, also illustrated on this month's cover. Although not a slum clearance project, it is a low-rent apartment.

Following is a general description of the type of projects now under way, grouped by city:

Atlanta

Techwood. A 10 square block project, the first of the Federal low-cost projects advertised for construction bids. Will accommodate 603 families in apartments and row houses and 318 students in a dormitory. Replaces 13 blocks of slum area. The area is adjacent to Georgia Tech, students of which will reside in the dormitory. There will be 23 buildings, including 13 three-story apartments. Will provide 128 four-room; 29, five-room, and 26, six-room row houses. 396, three-room apartments; 24, five-room apartments, and 159 dormitory rooms. Apartments will have incinerators, electric stoves, refrigerators, and lights, and the buildings will be steam heated with purchased steam.

University. At the time of going to press this contract has not as yet been let but it will be slightly larger than the Techwood project and will probably have it own central heating plant.

Two views of the Juniata Park low-cost project, Philadelphia. The first tenants were admitted to this building early in January, 1935. It will be occupied primarily by hosiery workers, who will pay a low rent.

A housing project in Queens, New York—Boulevard Gardens. Like the Hillside project this group is being erected on formerly unused land.

Montgomery, Ala.

The project in this city will consist of 160 row houses for negro occupancy, located across from the Alabama State Normal School for Negroes. Houses range in size from one large room, kitchen, and bath to four and five rooms. By retention of simple features, each house will be offered at extremely low rentals, probably not in excess of rents paid in that area for socially undesirable houses.

Cleveland

Cedar-Central. Will provide living quarters for 624 families. This project, a limited dividend one, was recently taken over by part of the Federal program. Located about 1½ miles from Public Square, it is easily accessible to large industrial and commercial districts. Site was one of the seven major blighted areas of the city. Will consist principally of apartments, with 216, three-room units; 345, four-room units, and 63, five-room units. Projects will be self-liquidating.

Euclid. A limited dividend project in Euclid, a suburb of Cleveland, which consists principally of houses heated mostly by warm air. This project has been completed.

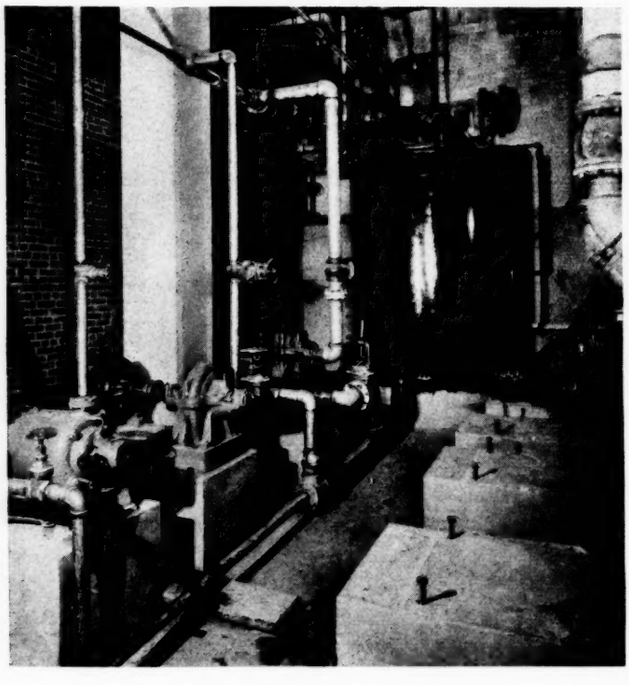
Philadelphia

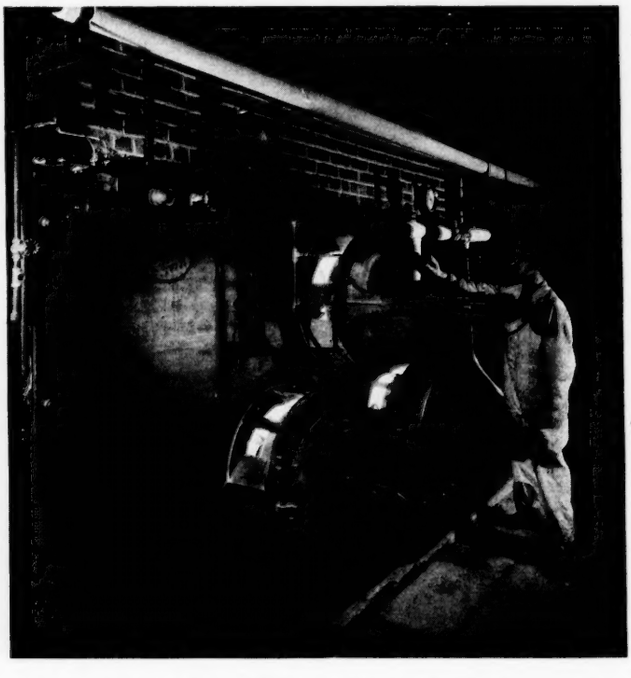
Juniata Park. A limited dividend project located in the Kensington area, erected by the Juniata Park Housing Corporation, which was formed by the American Federation of Hosiery Workers. PWA loan was secured by a first mortgage on the project. The corporation will be limited on its dividends on earnings to 4% on common stock and 6% on preferred stock. Earnings above these limitations must be returned to the benefit of tenants in the form of lowered rents. Project is self-liquidating, designed to be amortized in 33 years. Buildings have 84, two-and-a-half room apartments; 126, four-room; 74, five-room apartments. Located a short distance from a number of hosiery and textile mills. First tenants were admitted early in January, 1935.

New York

Knickerbocker Village. A limited dividend project located in the lower east side of Manhattan and erected by the Fred F. French Company. First tenants were admitted in the fall of 1934, making this the first of the Federal-financed apartment type low-cost housing projects to be occupied. Contains 1592 apartments. Was erected on the site of socially undesirable slums. The rents are such that the project accommodates the middle class wage earner rather than the type which formerly occupied the slums.

Hillside. Located along the Boston Post Road in the northeastern part of the Bronx on a 14-acre tract, on unused and unoccupied land, and in this respect is not a slum clearance project. Consists of five principal buildings divided into 108 sections of four and six stories. Each section to accommodate about 15 families. Most of the 1416 apartments will be of two, three, or four rooms. Each apartment will have cross ventilation and mechanical refrigeration and inciner-





Two views of the mechanical equipment in Knickerbocker Village, New York, a large slum clearance project which contains 1592 apartments.

Photo by Albert Rothschild

Exterior of Knickerbocker Village, New York.

ators. Expected to be completed about April, 1935. A limited dividend project.

Boulevard Gardens. Located in Woodside, Queens, where about 40% of the site will be covered by buildings. Comparable to the Bronx development in many ways, particularly in that it is also being erected on previously unused land.

Williamsburg. A federal project in the Williamsburg section of Brooklyn covering 12 square blocks, about 20 acres. A slum clearance project, the site is readily accessible to shopping and employment sections. Preliminary studies indicate that two-, three-, and possibly four-room walk-up apartments will be erected. As on all PWA low-cost housing developments, buildings will not occupy more than 30% of the land.

Brooklyn Polytechnic. A limited dividend project to be erected by Brooklyn Polytechnic Institute. Site is located adjacent to a city park area and is bounded by 4th and 5th Streets, 4th and 5th Avenues. The equity of Brooklyn Poly in land and cash in the project amounts to 21%.

Indianapolis

A slum clearance project, for negro occupancy. Will have 15 apartment houses, three and four stories in height, and 92 row houses, two stories in height. Apartments will provide for 457, three-room units; 202, four-room units, and two, five-room apartments.

Louisville

Three square blocks covering 11 acres. Slum clearance projects which will consist of three-story apartments, two-story row houses. Twenty per cent of the dwelling units will be two-rooms, 50%, three-rooms, and 30%, four rooms.

Chicago

Has three projects under way, one in the *southwest* taking up 37 square blocks which will consist of good metropolitan housing for some 3000 families at moderate rents. The new buildings will consist of two-, three- and four-story apartments and row houses.

Another project on the *north side,* a slum clearance project, will cover about 70 acres. Will provide accommodation for families in the lower income class. Condemnation proceedings have been begun and negotiations for sale of the land are being carried on.

South Park Gardens. On the *south side.* Covers approximately 35 acres, consisting of modern apartment houses at moderate rents. Condemnation has been begun and sale of land is being negotiated.

With these projects as an example, it is conceivable that local interest may be aroused to the point where individual cities and states may make more headway in financing such developments. If this happens, the market for heating installations will be a created one, and one that would not otherwise have existed, since the very low wage earner group has not before been an occupant of central-heated buildings.

Although not yet definitely settled, it is possible that the government will spend still more money than has been so far allocated. According to Secretary Ickes, in an address before the National Public Housing Conference in Washington January 19, a comprehensive slum clearance program will play a large part in the $4 billion relief program. He said, in part:

"Low-rent housing is my major personal interest in the whole PWA program. We hope that under the leadership of President Roosevelt this program will be greatly expanded this year.

"Such countries as Great Britain, Austria, Germany, and Italy are far ahead of the richest and most enterprising country in the world in the matter of housing, having discovered and frankly admitted that slums cannot be eradicated except on the basis of a government subsidy."

He explained that the slum clearance and low-cost housing program did not "conflict" with the FHA program.

"It will be readily seen that the low-cost housing program is distinct and apart from the problem of cleaning out the slums and building low-rental homes for those in the lower income classes who never have had any credit at the bank," he said.

Mr. Ickes criticized private capital for what he regarded as failure to cooperate in the slum-clearance program, saying:

"An invitation went out for the formation of limited dividend corporations to provide low-cost housing. Our private initiative, as sometimes happens when the goal is a social good instead of a private profit, was unable or unwilling to undertake much that was worth while.

"The housing division of PWA is looking much further into the future than the expenditure on slum-clearance projects of the mere $150,000,000 that has been allocated to it to date for that purpose."

Study for Housing Project Shows Cost Savings with Heating from Private Electric Plant

ON previous pages the general subject of large scale housing has been discussed in some detail. It is obvious that in any project involving a very large sum of money, as most housing projects do, and with the necessity for renting apartments at an extremely low rate, considerable attention must be paid to the most economical type of construction, height of building, and equipment used. Such a study involves a great deal of time and experience.

This article describes part of such a study. The part described here is that which relates to the heating and other mechanical equipment alone and shows one method of presenting the results.

The study was made by the office of Percival Robert Moses and Associates, and particularly by George Chadeayne, associate of that office, cooperating with the Housing Study Guild.

The Project

The project for which the study was made comprises an area of one-quarter square mile divided into six equal blocks. The buildings were estimated for a number of different types of construction and heights as follows:

1—Two-story buildings, cantilever construction, 20 buildings to the block having so-called ribbon windows.

2—Two-story buildings of bearing wall construction, 20 buildings to the block, with regular double hung windows.

Both of the above constructions were estimated for four different types of insulation:

A—With insulation only in the roof and overhang, the insulation consisting of 1 in. of cork or equivalent.

B—With insulation as in (A) plus metallic insulation on both sides of the studs and side walls.

C—With insulation as in (A) and with metallic insulation throughout the ground floor.

D—With insulation as in (A) plus (B) plus (C).

3—Three-story buildings of both cantilever and bearing wall construction, with insulation as in (D).

4—Four-story buildings of both cantilever and bearing wall construction with insulation as in (D).

5, 6, 7, and 8—Six-, eight-, ten-, and twelve-story buildings, respectively, of cantilever construction and insulation (D).

All of the buildings from two to four stories inclusive have identical floor plans and all of the buildings from six to twelve stories have identical floor plans. In both cases the estimated number of persons corresponds to the number of rooms and the apartments average four rooms, counting the kitchens as a room but not the baths.

Proposed Heating Systems

Since the study was concerned with low-cost housing only, the least costly types of heating systems were considered. These were:

1—A one-pipe coal-fired steam system in each building, with either an indirect water heater connected to the boiler or a separate coal-fired water heater. Electricity to be purchased from the utility.

2—One-pipe oil-fired steam system with boilers in each building, and a water heating coil submerged below the water line. Electricity purchased from the utility.

3—A central generating plant supplying medium pressure steam to each building in which reducing valves are located. Each building has a one-pipe low-pressure steam system, and a hot water tank equipped with steam coils. Steam to be bled from the turbines at some stage at 50-lb. pressure. The central plant generates electricity for lighting, elevators, and refrigeration in all the buildings.

4—The same as System (3) except that the individual buildings have a hot water system, water for which is heated in converters supplied with steam from the central plant. The electricity, as in (3), is generated in a central plant.

5—A single pipe steam system and steam heated domestic hot water apparatus in each building, with steam supplied from a central plant which generates steam for heating only. Electricity purchased from the utility.

The Table

The table on the following page summarizes the results of the study. Some explanation of the table may be necessary.

The letters A, B, C, and D at the top of the table refer to the type of insulation as explained in the previous text. The Section devoted to "Investment Dollars per Room, etc." shows the investment for four of the five systems. In each case the top horizontal column indicates the cost of the heating and hot water installation *per room*, the second horizontal column being the previous figure multiplied by 9% and divided by 12 so as to give the fixed charges per room *per month* on the heating installation. The last two lines show the investment and fixed charges on the electric generating plant.

The section entitled "Operating Dollars, etc." shows the operating cost for the mechanical equipment, including elevators where they are necessary—that is in the six-, eight-, ten-, and twelve-story buildings.

The section entitled "Total Rent Dollars, etc." shows the net cost of heat and hot water and the total rent per room per month for mechanical equipment; that is, the total rent is the fixed charges for the system per month plus the operating charges. The net cost of the heat and hot water includes the fixed charges on the heating apparatus plus the operating charges for

Comparison of Investment, Operating Cost and Fixed Charges for Various Types of Mechanical Equipment Plants for a Proposed Housing Project

	2-STORY CANTILEVER RIBBON WINDOW				2-STORY BEARING WALL DOUBLE-HUNG SASH				3-STORY		4-STORY		6 STORY CANTILEVER,	8 STORY RIBBON	10 STORY WINDOW	12 STORY
INSULATION (ABCD see explanation below)	A	B	C	D	A	B	C	D	D	D	D	D	D	D	D	D
SQUARE FEET OF RADIATION	AV.RM 45+	40	41.75	36	34	25.6	30	21.6	34	19.3	32.4	18.15	26.2	25.9	25.48	25.
NUMBER OF BUILDINGS	120	120	120	120	120	120	120	120	108	108	96	96	54	48	42	36
NUMBER OF APARTMENTS	1440	1440	1440	1440	1440	1440	1440	1440	1944	1944	2304	2304	2592	3072	3360	3456
NUMBER OF ROOMS	5760	5760	5760	5760	5760	5760	5760	5760	7776	7776	9216	9216	10368	12288	13440	13824
INVESTMENT DOLLARS PER ROOM REQUIRED WITH INTEREST, DEPRECIATION, TAXES & INSURANCE @ 9%																
SYSTEM 1: Heating Investment	$69.00	$62.50	$55.00	$56.00	$67.00	$52.25	$56.50	$47.00	$52.40	$43.40	$46.75	$37.60	$39.10	$37.95	$34.22	$33.62
@ 9% per room per month	.52	.465	.49	.42	.50	.39	.425	.35	.39	.33	.35	.28	.29	.28	.26	.25
SYSTEM 2: Heating Investment	100.15	93.65	96.15	87.15	98.15	83.40	87.65	78.15	86.60	73.50	68.75	59.60	57.10	50.45	45.22	42.62
@ 9% per room per month	.75	.70	.71	.65	.735	.625	.656	.585	.65	.55	.515	.447	.44	.38	.34	.32
SYSTEM 3: Heating Investment	77.00	68.50	73.00	61.50	70.00	52.60	61.75	44.50	56.50	40.50	51.50	36.75	43.00	41.50	40.90	40.90
@ 9% per room per month	.58	.515	.55	.46	.525	.395	.465	.34	.424	.30	.39	.28	.32	.31	.305	.306
SYSTEM 4: Heating Investment	81.25	72.00	75.50	65.00	73.50	55.00	65.00	46.60	60.00	42.50	54.60	38.22	45.58	44.00	43.35	43.35
@ 9% per room per month	.61	.54	.565	.49	.55	.41	.49	.35	.45	.32	.41	.28	.34	.33	.32	.32
SYSTEM 5 (eSee Description of System)																
ELECTRIC PLANT, DISTRIBUTION (Systems 3 & 4) @ 9% per room per month	15.88 .12	15.88 .12	15.88 .12	15.88 .12	15.88 .12	15.88 .12	15.88 .12	15.88 .12	14.76 .11	14.76 .11	13.64 .10	13.64 .10	13.81 .10	13.20 .10	13.07 .10	13.01 .10
OPERATING DOLLARS PER ROOM PER MONTH REQUIRED FOR HEATING, HOT WATER, LIGHTING, REFRIGERATION, PUBLIC LIGHT AND POWER																
SYSTEM 1:																
Heating Fuel per room per month	.75	.66	.695	.60	.567	.425	.50	.36	.565	.32	.54	.30	.435	.43	.425	.415
Hot Water " " "	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204
Lighting Current ditto	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53
Refrigeration " "	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47
Elevator " "	-	-	-	-	-	-	-	-	-	-	-	-	.24	.26	.34	.36
Repairs & Maintenance "	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
Labor	.44	.44	.44	.44	.44	.44	.44	.44	.39	.39	.33	.33	.29	.25	.23	.22
SYSTEM 2:																
Heating Fuel per room per month	.75	.66	.695	.60	.567	.425	.50	.36	.565	.32	.54	.30	.328	.32	.32	.32
Hot water " ditto	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.204	.15	.15	.15	.15
Lighting current "	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53	.53
Refrigeration " "	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47
Elevator " "	-	-	-	-	-	-	-	-	-	-	-	-	.24	.26	.34	.36
Repairs & Maintenance "	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12
Labor "	.19	.19	.19	.19	.19	.19	.19	.19	.16	.16	.12	.12	.06	.06	.05	.05
SYSTEM 3:																
Heating Fuel "	.60	.525	.55	.48	.45	.34	.40	.285	.45	.257	.41	.24	.35	.34	.34	.34
SYSTEMS 3 & 4:																
Hot Water Fuel per room per month	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166	.166
Lighting Fuel ditto	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
Refrigeration Fuel "	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
Elevator Fuel "	-	-	-	-	-	-	-	-	-	-	-	-	.02	.02	.03	.03
Rep, Maint, Metering & Billing ditto	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166	.1166
Labor "	.158	.158	.158	.158	.147	.147	.147	.147	.145	.145	.142	.096	.127	.131	.12	.12
SYSTEM 4:																
Heating Fuel "	.51	.445	.47	.41	.38	.29	.34	.24	.38	.22	.35	.21	.30	.29	.29	.29
SYSTEM 5 (eSee Description of System)																
TOTAL RENT DOLLARS PER ROOM PER MONTH REQUIRED FOR HEATING, HOT WATER, LIGHTING, REFRIGERATION, PUBLIC LIGHT & POWER																
SYSTEM 1:																
Net cost of Heat & Hot Water	2.00	1.83	1.92	1.76	1.80	1.55	1.66	1.44	1.64	1.33	1.52	1.21	1.31	1.26	1.20	1.17
Total Rent per Room per Month	3.00	2.83	2.92	2.75	2.80	2.55	2.66	2.44	2.64	2.33	2.52	2.21	2.35	2.32	2.54	2.53
SYSTEM 2:																
Net Cost of Heat & Hot Water	2.02	1.87	1.92	1.76	1.82	1.56	1.67	1.46	1.70	1.36	1.50	1.20	1.10	.98	.93	.91
Total Rent per Room per Month	3.02	2.87	2.92	2.76	2.82	2.56	2.67	2.46	2.70	2.35	2.50	2.20	2.34	2.24	2.27	2.27
SYSTEM 3:																
Net Cost of Heat & Hot Water	.81	.67	.73	.56	.59	.35	.49	.25	.48	.17	.39	.07	.02	-.01	-.09	-.11
Total Rent per Room per Month	1.81	1.67	1.73	1.56	1.59	1.35	1.49	1.25	1.48	1.17	1.39	1.07	1.26	1.25	1.25	1.25
SYSTEM 4:																
Net Cost of Heat & Hot Water	.75	.61	.66	.52	.55	.31	.45	.21	.44	.14	.36	.04	-.01	-.04	-.13	-.15
Total Rent Per Room per Month	1.75	1.61	1.66	1.52	1.55	1.31	1.45	1.21	1.44	1.14	1.36	1.04	1.23	1.22	1.21	1.21
SYSTEM 5:																
Net Cost of Heat & Hot Water	1.54	1.40	1.46	1.28	1.33	1.09	1.22	.98	1.23	.91	1.15	.82	1.00	1.00	.98	.97
Total Rent Per Room per Month	2.54	2.40	2.46	2.28	2.33	2.09	2.22	1.98	2.23	1.91	2.13	1.82	2.24	2.26	2.32	2.33

Rent means total cost: under systems 1, 2 & 5, rent includes cost of electricity purchased by tenants and owner; under systems 3 & 4, includes cost of producing all electricity as well as steam.

NOTE A

The top figures for the various systems under the TOTAL RENT DOLLARS show the net cost for heat and hot water after tenant pays the standard rate for electricity used and the public light and power is credited (at standard rates) to Systems 3 and 4.

NOTE B

The top figures for system 5 under the TOTAL RENT DOLLARS when subtracted from the total rent figures under TOTAL RENT DOLLARS for systems 3 and 4, gives the total cost of electricity from the central plant. Consumption 18.8 KWH per room per month, plus 4 KWH per room per month for public light.

DESCRIPTION OF SYSTEMS

SYSTEM 1

Comprises a single pipe steam job including boiler and domestic hot water apparatus in each building using #2 rice coal at $6.00 per ton and 50% efficiency. Electricity purchased. (Fuel cost for 1 sq.ft. radiation per year at 400 lbs.steam cost 20¢.)

SYSTEM 2

Comprises a single pipe steam job including boiler and domestic hot water apparatus in each building using #5 oil 146,000 Btu. 5¢ per gallon to 4 stories and #6 oil 150,000 Btu. 4¢ per gallon 6-12 stories, both efficiencies 70%. (Fuel cost for 1 sq.ft. radiation per year at 400 lbs. steam, cost 20¢ to 4 stories and 15¢ 6 to 12 stories.)

SYSTEM 3

Comprises a single pipe steam job and steam heated domestic hot water apparatus in each building and a central plant generating steam for heating, and electricity as a by-product of this same steam costing 40¢ per 1000 lbs. of steam. (Fuel cost for 1 sq.ft. radiation per year at 400 lbs. steam, cost 16¢.)

SYSTEM 4

Comprises hot water heating circuits with converters heated by steam and steam heated domestic hot water apparatus in each building and a central plant generating steam for heating and electricity as a by-product of this same steam costing 40¢ per 1000 lbs. of steam. (Fuel cost for 1 sq.ft. radiation per year at 400 lbs. steam, cost 13.6¢.)

SYSTEM 5

Comprises a single pipe job and steam heated domestic hot water apparatus in each building and a central plant generating steam for heating ONLY. Electricity purchased. (Fuel cost for 1 sq.ft. radiation per year at 400 lbs. steam, cost 16¢.)

INSULATION: A - Roof and Overhand. B - Roof, Walls and Overhang. C - Roof and Ground Floor. D - Roof, Walls and Ground Floor.

the heating apparatus, except in those cases where a central generating plant is specified. In these cases it is assumed that $1 per room per month is the amount paid by the tenant to the utility for electricity and should be paid to the owner of the building. When this is deducted from the total cost of all mechanical equipment it is found that the heating cost is very low and, in the case of elevator-equipped buildings, where an additional charge is made for electricity to operate the elevators, it is found that the landlord is actually making money on his heating plant. In these cases the figures are preceded by a minus sign.

The costs of local heating systems and domestic hot water supply in each building are clearly the most expensive in their effect on the rent per room per month. This is due mostly to the operating costs. These systems when coal-fired are slightly lower than oil-fired in the smaller buildings in terms of rent per room per

month and slightly higher in the larger buildings. The reason for this is that higher-priced oil must be used in the smaller buildings.

Comparison of Electrical Costs

Obviously, any one studying the report and attempting to make a decision from these figures, arrives at the conclusion that the most important thing shown by the report is that there is a marked difference between the cost of generating electricity on the premises and in purchasing it from the utility at wholesale rates.

If the owner is to install the distribution system in both cases and also assume the cost of maintenance and metering and billing in both cases, his problem begins at that point at which the current enters his distributing system.

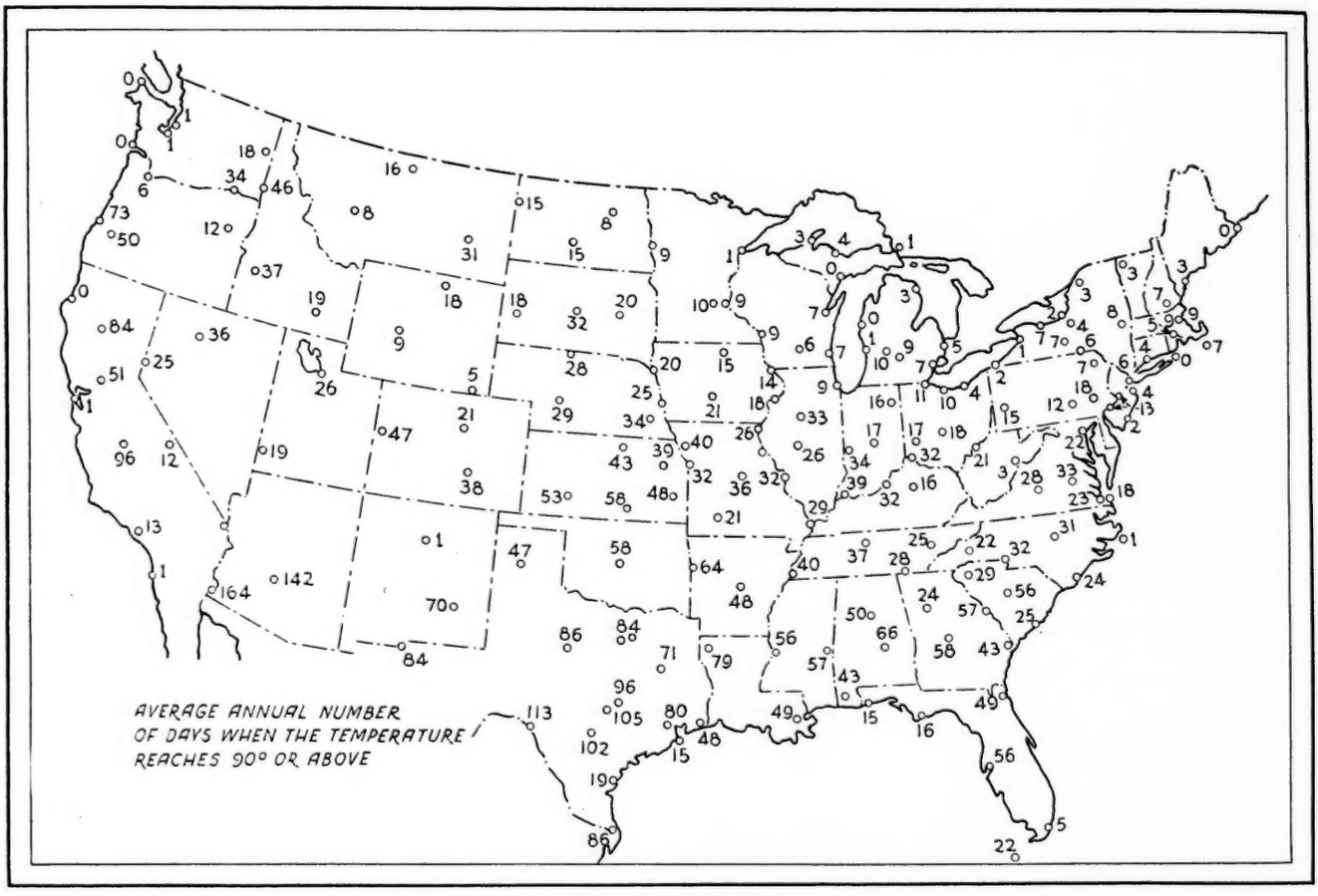
Hence, it becomes a question of how much will it cost the owner per kilowatt-hour to obtain electricity at the beginning of his own distributing system from (a) his own central plant and (b) the local public utility company.

Answering this question concerning private central plant, the following figures are offered as an example. They refer to the six-story buildings. The investment for the generating plant required per room is shown on the tabulation as $13.81, and of this 33% is the cost of the distribution system; hence, the investment for the installation of the generating plant is $9.11 per room. At 9% for interest, taxes, depreciation, and insurance, the money cost would be 6.8 cents per room per month. The cost of fuel for producing electricity (extra fuel above that required for heating and hot water, taken from the tabulation, horizontal columns No. 34-35-36) for lighting, refrigeration, public light and power is 9 cents per room per month and the proportionate cost of the labor in column 38 for the electric generation is 1.7 cents per room per month. Adding these costs together, we get a total of 17.5 cents per room per month for electricity, including the proportional part of the public light and power per room.

Since the electrical costs in all the columns of the tabulation for both purchased and central plant electricity are based on a consumption of 16.6 kw-hr. per room per month for private lighting and refrigeration and the proportional part of the public lighting and elevator load is 4 kw-hr. per room per month, the total consumption is 20.6 kw-hr. per room per month consumption.

Since the total cost per room per month is 17.5 cents and the total consumption is 20.6 kw-hr. per room per month, the cost per kilowatt-hour from a central plant is 17.5 divided by 20.6 or 8½ mills per kw-hr.

Summer Weather Data Chart Corrected



The above map is a corrected copy of the summer weather data map which appeared in the November, 1934, issue. It gives the average number of days when the temperature reaches 90° or above. The original map was erroneously credited to Joseph B. Kincer.

U. S. Has 231,403 Gas-Heated Houses—

A gain of 11.6% over 1933. Other buildings so heated increase 23.7% to 11,833

THERE are no less than 269,232 gas-fired central heating systems in buildings in this country.[1] Of these, 256,355 are installations in houses and 12,877 are in all other types of buildings.

From July 1, 1933 to July 1, 1934 the number of installations in dwellings increased 11.6%, while those in other buildings increased 23.7%.

There are at least 57,075 radiator heat installations in buildings heated by gas of which 32,105 have straight gas-designed boilers, the remaining 24,970 being heated by conversion burners.

Of the 168,906 gas-fired, warm-air-heated dwellings, 91,954 are gas-designed furnaces, the remaining 76,852 being conversion burner jobs.

There are 9560 radiator-heated buildings other than dwellings using gas, and 2273 warm-air-heated buildings other than dwellings with gas as a fuel. Of the former, 3168 are gas designed, and 6392 have conversion burners. Of the warm-air jobs, 1265 are gas designed, and 1008 have conversion burners.

The above data are all from the latest report of the House Heating and Cooling Committee of the American Gas Association.[2]

The number of heating installations using a given fuel is always a matter of some question. The figures quoted are accurate so far as they go. While they are probably correct for the companies reporting they do not, as mentioned, include companies which did not report. Furthermore, they do not include buildings heated by gas radiant heaters, and similar devices. The total number of buildings actually heated by gas probably lies somewhere between the 269,232 reported here, and a figure approximately 1,600,000 which can be obtained by projecting the data from the Real Property Inventory. This latter method is open to rather serious objection, since the smaller towns are not even on the lines of gas companies in many cases.

It is quite possible, though, that the total number of gas-heated buildings in this country lies somewhere in the neighborhood of the average of the last two mentioned figures, which would be about one million.

It is fairly well established that there are at least a million oil burners in central plants in this country, not including oil-burning space heaters and distillate burners. From this it would seem reasonable to believe that the number of oil-heated buildings of all kinds may be nearly the same as the number of gas-heated buildings.

[1]The phrase "no less than" is used here and frequently in the remainder of the article because the figures presented cover only those companies which reported to the American Gas Association. How many installations are on the lines of companies which do not report is not known. It should also be noted that these figures cover only buildings heated by gas from a central point and do not purport to include buildings heated with gas burned in radiant heaters, gas-fired radiators, and similar devices.

[2]Of which C. A. Nash, United Light & Power Heating and Construction Co., Davenport, Iowa, is chairman. The tables appearing in this article are from the committee report, but are rearranged and summarized.

TABLE 1

INCREASE IN NUMBER OF INSTALLATIONS (IN OTHER THAN HOUSES) OF GAS-FIRED CENTRAL HEATING SYSTEMS

(JULY 1, 1933 TO JULY 1, 1934)

RADIATOR HEAT	MANUFACTURED GAS	NATURAL GAS	TOTAL
Gas Designed	6.9%	27.2%	20.8%
Conversion	62.5	17.8	18.5
Total	12.3	20.2	19.3
WARM-AIR HEAT			
Gas Designed	41.6	68.2	57.1
Conversion	53.2	33.3	34.6
Total	43.0	47.3	46.3
TOTAL	21.4%	24.0%	23.7%

TABLE 2

NUMBER OF INSTALLATIONS (IN OTHER THAN HOUSES) OF GAS-FIRED CENTRAL HEATING SYSTEMS

(AS REPORTED BY 188 GAS COMPANIES, AS OF JULY 1, 1934)

RADIATOR HEAT	MANUFACTURED GAS (100 Companies)	NATURAL GAS (88 Companies)	TOTAL (188 Companies)
Gas Designed	878	2290	3168
Conversion	143	6249	6392
Total	1021	8539	9560
WARM-AIR HEAT			
Gas Designed	473	792	1265
Conversion	72	936	1008
Total	545	1728	2273
TOTAL†	1566	10,267	11,833

†*These figures cover only companies which gave comparable data for* 1933 *and* 1934. *The totals of all companies reporting are* 1708, 11,169, *and* 12,877, *respectively, as compared with the above* 1566, 10,267, *and* 11,833.

TABLE 3

INCREASE IN NUMBER OF GAS-FIRED CENTRAL HOUSE-HEATING INSTALLATIONS

(JULY 1, 1933 TO JULY 1, 1934)

RADIATOR HEAT	MANUFACTURED GAS (199 Companies)	NATURAL GAS (94 Companies)	TOTAL (293 Companies)
Gas Designed	0.9%	5.0%	1.8%
Conversion	179.0	3.4	45.1
Total	26.2	4.0	17.1
WARM-AIR HEAT			
Gas Designed	0.3	9.7	8.5
Conversion	178.0	5.5	11.4
Total	32.8	7.7	9.8
TOTAL	28.2%	7.3%	11.6%

TABLE 4. NUMBER OF GAS-FIRED CENTRAL HOUSE-HEATING INSTALLATIONS

(As Reported by 293 Gas Companies, As of July 1, 1934)

State and Region	Radiator Heat		Warm-Air Heat		Total
	Gas Designed	Conversion	Gas Designed	Conversion	
Maine	123	17	14	10	164
New Hampshire	366	41	17	3	427
Vermont	5	6	3	1	15
Massachusetts	2699	1115	810	311	4935
Rhode Island	296	25	25	7	353
Connecticut	847	101	174	37	1159
NEW ENGLAND	4336	1305	1043	369	7053
New York	4780	1796	1116	1912	9604
New Jersey	2023	235	273	93	2624
Pennsylvania	6699	3278	2630	5496	18,103
MIDDLE ATLANTIC	13,502	5309	4019	7501	30,331
Ohio	66	146	550	399	1161
Indiana	111	156	212	290	769
Illinois	2562	4910	1354	3417	12,243
Michigan	691	368	478	604	2141
Wisconsin	501	14	294	14	823
EAST N. CENTRAL	3931	5594	2888	4724	17,137
Minnesota	308	316	150	405	1179
Iowa	99	264	430	1263	2056
Missouri	1724	3534	4296	11,489	21,043
North Dakota	—	—	—	—	—
South Dakota	14	75	141	445	675
Nebraska	113	63	955	463	1594
Kansas	421	1104	3238	8239	13,002
WEST N. CENTRAL	2679	5356	9210	22,304	39,549
Delaware	153	35	32	11	231
Maryland	3486	1056	155	229	4926
District of Columbia	—	—	—	—	5345
Virginia	101	15	14	0	130
West Virginia	70	67	154	162	453
North Carolina	2	0	1	1	4
South Carolina	1	1	0	3	5
Georgia	—	—	—	—	2106
Florida	6	2	2	5	15
SOUTH ATLANTIC	3819	1176	358	411	13,215
Kentucky	26	34	91	144	295
Tennessee	4	12	9	11	36
Alabama	181	288	203	217	889
Mississippi	15	10	4	3	32
EAST SOUTH CENTRAL	226	344	307	375	1252
Arkansas	38	275	24	76	413
Louisiana	13	2	80	1	96
Oklahoma	56	133	100	212	501
Texas	146	896	755	2147	3944
WEST S. CENTRAL	253	1306	959	2436	4954
Montana	85	742	298	1113	2238
Idaho	—	—	—	—	—
Wyoming	70	105	78	152	405
Colorado	423	1362	3174	3742	8701
New Mexico	63	2	524	258	847
Arizona	61	31	70	50	212
Utah	—	—	—	—	—
Nevada	0	0	2	0	2
MOUNTAIN	702	2242	4146	5315	12,405
Washington	66	4	938	9	1017
Oregon	253	3	3102	5	3363
California	2165	1559	64,655	32,748	101,127
PACIFIC	2484	1566	68,695	32,762	105,507
TOTAL, U. S.†	32,105	24,970	91,954	76,852	231,403

†Totals in the first three columns include some reported and distributed jobs in Georgia. The total in column 4 is greater than the total of columns 1, 2, and 3 by the undistributed jobs in Georgia and District of Columbia. The grand total of 231,403 does not include installations of companies which did not report comparable data for 1933 and 1934. Addition of these companies' installations brings the grand total to 256,355.

PIPE AND PIPE FITTINGS—1

Dimensions and Weights of Standard Steel and Wrought-Iron Pipe

Nominal Size	Diameters		Thickness	Weight per Foot, Pounds		Threads per Inch	Couplings		
	External	Internal		Plain Ends	Threaded and Coupled		Diameter	Length	Weight, Pounds
⅛	0.405	0.269	0.068	0.244	0.245	27	0.562	⅞	0.029
¼	0.540	0.364	0.088	0.424	0.425	18	0.685	1	0.043
⅜	0.675	0.493	0.091	0.567	0.568	18	0.848	1⅛	0.070
½	0.840	0.622	0.109	0.850	0.852	14	1.024	1⅜	0.116
¾	1.050	0.824	0.113	1.130	1.134	14	1.281	1⅝	0.209
1	1.315	1.049	0.133	1.678	1.684	11½	1.576	1⅞	0.343
1¼	1.660	1.380	0.140	2.272	2.281	11½	1.950	2⅛	0.535
1½	1.900	1.610	0.145	2.717	2.731	11½	2.218	2⅜	0.743
2	2.375	2.067	0.154	3.652	3.678	11½	2.760	2⅝	1.208
2½	2.875	2.469	0.203	5.793	5.819	8	3.276	2⅞	1.720
3	3.500	3.068	0.216	7.575	7.616	8	3.948	3⅛	2.498
3½	4.000	3.548	0.226	9.109	9.202	8	4.591	3⅝	4.241
4	4.500	4.026	0.237	10.790	10.889	8	5.091	3⅝	4.741
4½	5.000	4.506	0.247	12.538	12.642	8	5.591	3⅝	5.241
5	5.563	5.047	0.258	14.617	14.810	8	6.296	4⅛	8.091
6	6.625	6.065	0.280	18.974	19.185	8	7.358	4⅛	9.554
7	7.625	7.023	0.301	23.544	23.769	8	8.358	4⅛	10.932
8	8.625	8.071	0.277	24.696	25.000	8	9.358	4⅝	13.905
8	8.625	7.981	0.322	28.554	28.809	8	9.358	4⅝	13.905
9	9.625	8.941	0.342	33.907	34.188	8	10.358	5⅛	17.236
10	10.750	10.192	0.279	31.201	32.000	8	11.721	6⅛	29.877
10	10.750	10.136	0.307	34.240	35.000	8	11.721	6⅛	29.877
10	10.750	10.020	0.365	40.483	41.132	8	11.721	6⅛	29.877
11	11.750	11.000	0.375	45.557	46.247	8	12.721	6⅛	32.550
12	12.750	12.090	0.330	43.773	45.000	8	13.958	6⅛	43.098
12	12.750	12.000	0.375	49.562	50.706	8	13.958	6⅛	43.098
13	14.000	13.250	0.375	54.568	55.824	8	15.208	6⅛	47.152
14	15.000	14.250	0.375	58.573	60.375	8	16.446	6⅛	59.493
15	16.000	15.250	0.375	62.579	64.500	8	17.446	6⅛	63.294

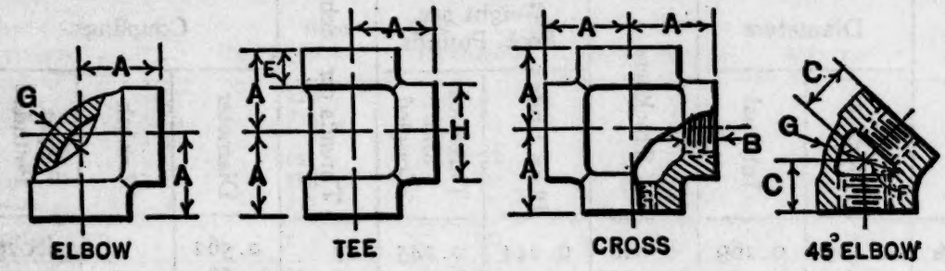
National Tube Co.

Above is a table of the dimensions and weights of standard steel and wrought-iron pipe. Although there are three weights of pipe available—standard, extra strong, and double extra strong—the standard weight is the type commonly used in heating work. It should be noted that since the external diameter of the three weights of pipe has to be kept the same, the extra and double extra sizes have smaller internal diameters and therefore smaller capacities.

A table of the dimensions of American Standard cast-iron screw fittings appears on the other side of this sheet. Cast-iron screwed fittings are most commonly used on heating pipes up to 4-in. diameter. Above this, flanged fittings are much used although screwed fittings are available.

PIPE AND PIPE FITTINGS—1

American Standard Cast-Iron Screwed Fittings



Pipe Size	A	C	B Min.	E Min.	F Min.	F Max.	G Min.	H Min.
Fittings for 125 Pounds per Square Inch								
¼	0.81	0.73	0.32	0.38	0.54	0.58	0.110	0.93
⅜	0.95	0.80	0.36	0.44	0.67	0.71	0.120	1.12
½	1.12	0.88	0.43	0.50	0.84	0.89	0.130	1.34
¾	1.31	0.98	0.50	0.56	1.05	1.10	0.155	1.63
1	1.50	1.12	0.58	0.62	1.31	1.38	0.170	1.95
1¼	1.75	1.29	0.67	0.69	1.66	1.73	0.185	2.39
1½	1.94	1.43	0.70	0.75	1.90	1.97	0.200	2.68
2	2.25	1.68	0.75	0.84	2.37	2.44	0.220	3.28
2½	2.70	1.95	0.92	0.94	2.87	2.97	0.240	3.86
3	3.08	2.17	0.98	1.00	3.50	3.60	0.260	4.62
3½	3.42	2.39	1.03	1.06	4.00	4.10	0.280	5.20
4	3.79	2.61	1.08	1.12	4.50	4.60	0.310	5.79
5	4.50	3.05	1.18	1.18	5.56	5.66	0.380	7.05
6	5.13	3.46	1.28	1.28	6.62	6.72	0.430	8.28
8	6.56	4.28	1.47	1.47	8.62	8.72	0.550	10.63
10	8.08	5.16	1.68	1.68	10.75	10.85	0.690	13.12
12	9.50	5.97	1.88	1.88	12.75	12.85	0.800	15.47
14 O.D.	10.40	.....	2.00	2.00	14.00	14.10	0.880	16.94
16 O.D.	11.82	.....	2.20	2.20	16.00	16.10	1.000	19.30
Fittings for 250 Pounds per Square Inch								
¼	0.94	0.81	0.43	0.49	0.54	0.58	0.18	1.17
⅜	1.06	0.88	0.47	0.55	0.67	0.71	0.18	1.36
½	1.25	1.00	0.57	0.60	0.84	0.89	0.20	1.59
¾	1.44	1.13	0.64	0.68	1.05	1.10	0.23	1.88
1	1.63	1.31	0.75	0.76	1.31	1.38	0.28	2.24
1¼	1.94	1.50	0.84	0.88	1.66	1.73	0.33	2.73
1½	2.13	1.69	0.87	0.97	1.90	1.97	0.35	3.07
2	2.50	2.00	1.00	1.12	2.37	2.44	0.39	3.74
2½	2 94	2.25	1.17	1.30	2.87	2.97	0.43	4.60
3	3.38	2.50	1.23	1.40	3.50	3.60	0.48	5.36
3½	3.75	2.63	1.28	1.49	4.00	4.10	0.52	5.98
4	4.13	2.81	1.33	1.57	4.50	4.60	0.56	6.61
5	4.88	3.19	1.43	1.74	5.56	5.66	0.66	7.92
6	5.63	3.50	1.53	1.91	6.62	6.72	0.74	9.24
8	7.00	4.31	1.72	2.24	8.62	8.72	0.90	11.73
10	8.63	5.19	1.93	2.58	10.75	10.85	1.08	14.37
12	10.00	6.00	2.13	2.91	12.75	12.85	1.24	16.84
14 O.D.	11.00	.....	2.25	3.10	14.00	14.10	1.33	18.40
16 O.D.	12.50	.....	2.45	3.45	16.00	16.10	1.50	20.88

All dimensions given in inches.

New District Steam Service in Chicago

A NEW steam service in a limited district just east of the Chicago River across from the Union Station has been inaugurated by the Chicago Steam Corporation in conjunction with the Chicago Tunnel Company. Mains are carried in tunnels of the latter company.

It is reported that the service was started on an experimental basis to determine the adaptability for steam transmission of the existing freight tunnels in the downtown area of Chicago and to endeavor to obtain some definite data on heat absorption by various earth strata. This is a field in which little experimenting has been done and it is felt that the information gained will be of value in making computations of new installations to steam utilities, public institutions, and municipalities interested in distributing steam from a central source.

No generating plant was built as steam is obtained by the use of excess capacity of the modern plant (built in 1930) of the Chicago Union Station Company.

An 8-in. supply main constituting a run of about 2000 ft. extends under Jackson Boulevard, about four blocks east of the Chicago River, while a 1000-ft. run of 4-in. main goes north two blocks on Franklin Street. In the area served, buildings are of both the office and loft type, old and new, and while most of them use steam for heating purposes only, some use it in various processes. Mains are reported to carry an average pressure of 150 lb. per sq. in.

Mains and branches are of all-steel welded construction, and the high-pressure drops from the traps are carried in extra heavy wrought-iron pipe. Slip type expansion joints are used throughout and all are externally guided by securely anchored ring guides in which slide fins attached to the pipe. Enough joints are provided to keep the traverse per joint under 5 in.

An interesting feature of the installation is the method of insulating the pipe at points of roller support. As these supports occur every 12 ft. it was realized that considerable heat would be dissipated by direct radiation if the conventional method of support were employed. Accordingly, an insulated support was designed that insulates the roller from the pipe by doing away with any metal-to-metal contact. This is accomplished by wrapping the pipe with 1 in. of wool felt which is held in place by a metal clamp 12 in. long, to which the customary supporting segment is welded and filled with plastic insulation. As a result the rollers and the pillow block bearings in which they turn are at the temperature of the surrounding air.

Piping insulation consists of 3 in. of 85% magnesia, applied in two layers, and covered by a jacket of asphalt roofing paper cemented to the covering and strapped in place. The line losses as determined by condensation meter coincide exactly with the theoretical losses per square foot of main. Even the slips of the expansion joints are covered by a quilted, removable asbestos blanket.

The freight tunnels in the area served with steam are reported never to have been used for freight traffic. Some of the sub-mains have been suspended from the tunnel roof in a way that permits the transmission of steam and the handling of freight trains in the same tunnel.

Service is to be available 12 months of the year and special inducements will be made to those who use steam throughout the summer. With the public fast becoming air conditioning minded, this may produce some interesting developments.

Piping was installed by Mehring and Hansen; insulation by Asbestos and Magnesia Materials Company; design by Neiler, Rich & Company, who also designed and patented the insulated pipe support used.

(Left) Steam main in tunnel which has no freight traffic. Typical anchored expansion joint with alignment guide is shown. (Right) Loop expansion joint which allows traffic in cross tunnel.

A New Friction Chart for Small Ducts

By P. F. BENEDICT

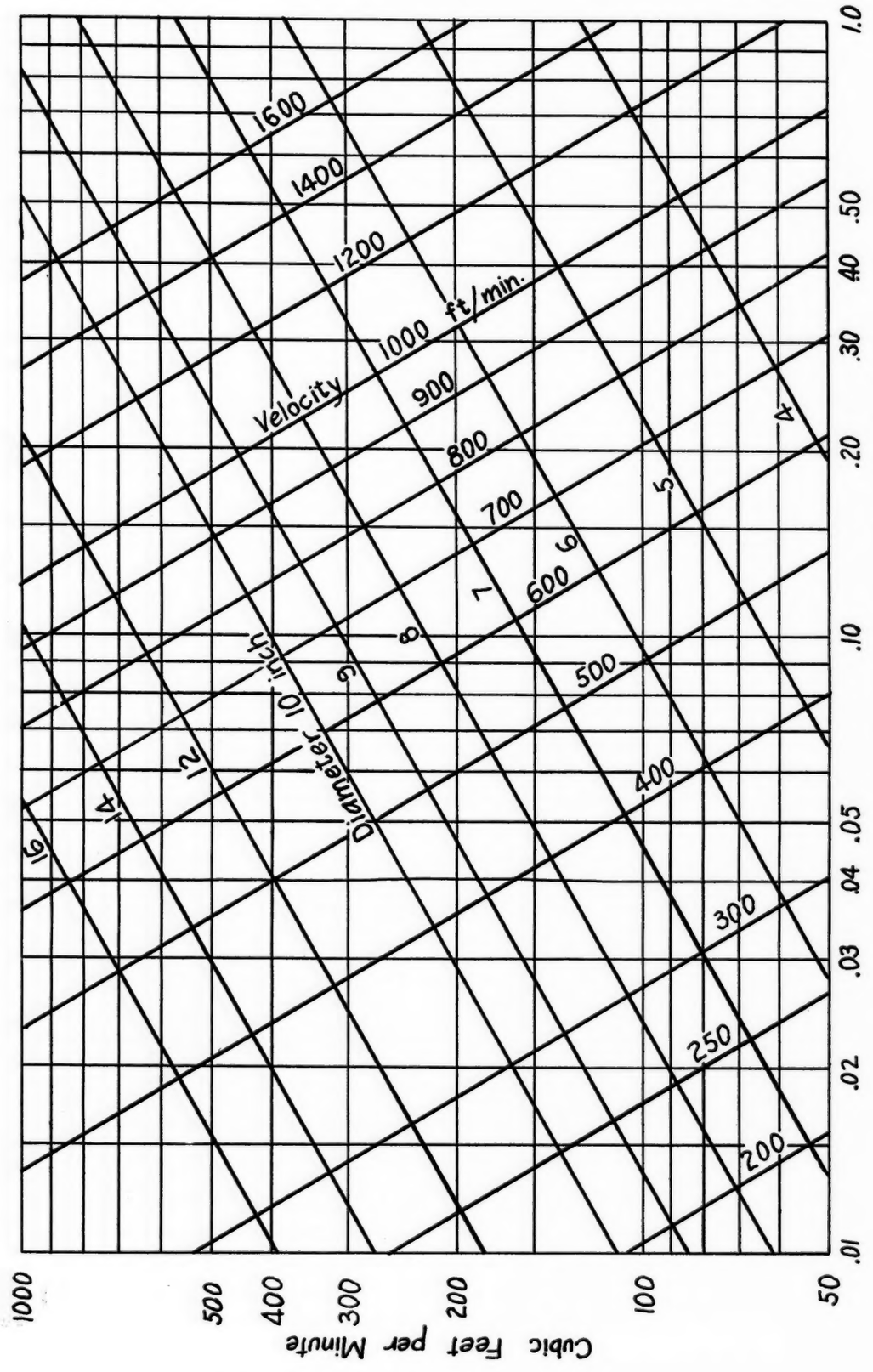


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Fig. 1. Friction chart for 130° air flowing through small ducts

THERE has been some criticism of the friction chart in its usual form as a method of sizing ducts for forced air heating in residences. Some heating engineers have felt, as the chart is based only on data for ducts in the neighborhood of 20 in. diameter, that in the range of 6 to 10 in. sizes it calls for ducts that are about 15% too large.

The literature in recent years has contained papers showing that friction and flow of fluids in pipes may be coordinated into one or two fundamental expressions. There have been articles by several writers, including a number by MacAdams, such as the one in "Mechanical Engineering," October, 1926. These develop a method which is readily applied to ducts for forced air heating, and may be used as a check on the friction chart. The frictional loss of pressure for flow in straight round pipes may be written as follows:

$$h = \frac{0.012\, f\, L\, W\, V^2}{D}$$

where

h = pressure loss in in. of water.
f = friction factor from Fig. 3.
L = lineal feet of pipe.
W = unit weight of fluid in lb. per cu. ft.
V = velocity in ft. per sec.
D = inside diameter in ft.
J = viscosity, lb. per sec. per ft.

To determine the friction factor for any given case, compute the Reynold's number = D W V/J and then take f from Fig. 3. Values of W and J for a few substances are as follows:

	W	J
water at 68°	62.3	0.000678
saturated steam at 212°	0.037	0.0000084
air at 70° and 45° dewpoint	0.074	0.0000124
air at 130° and 45° dewpoint	0.067	0.0000133

Viscosity in centipoises found in some data books may be converted to the above units by multiplying by 0.000672.

For example, given air at 70° flowing at 2000 f.p.m. through a duct 24 in. diameter, to find the pressure drop in 100 ft.

$$\text{Reynold's number} = \frac{2 \times 0.074 \times 33.3}{0.0000124} = 398{,}000$$

Then in Fig. 3 the friction factor is 0.0049

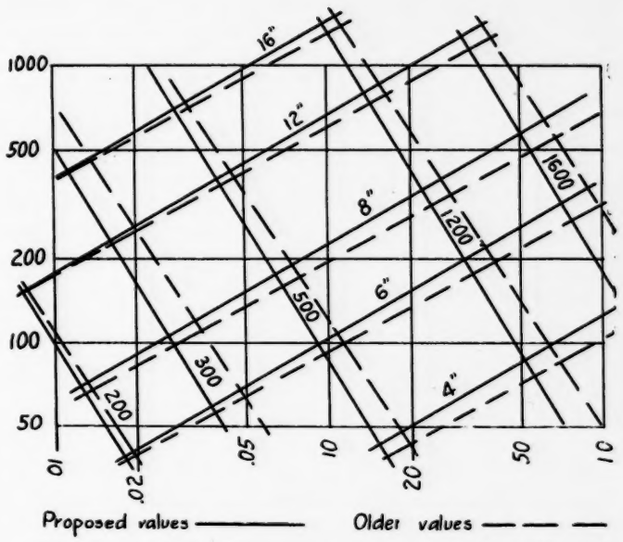


Fig. 2. Graphical comparison between the old and new friction charts

Substituting in the above formula for h

$$h = \frac{0.012 \times 0.0049 \times 100 \times 0.074\ (33.3)^2}{2} = 0.242$$

And 0.242 friction in inches of water agrees rather well with the friction chart as usually printed.

For pipes with particularly rough interior surfaces, values of f read from Fig. 3 may be about 5% too low, and for drawn brass tubing they may be 5% too high. It is almost surprising that the flow of many liquids and gases over wide ranges of velocities, densities, and viscosities should all be represented by the above formula for h, when all the friction factors are taken from a single curve as in Fig. 3, but such appears to be the case. If the friction loss is desired in some unit other than inches of water, such as pounds per square inch, the constant 0.012 must be changed accordingly.

On the above basis, computations have been made for a sufficient number of points to prepare Fig. 1. A comparison of the older with the newer lines is shown in Fig. 2. The new chart calls for somewhat smaller ducts than the usual friction chart, and it seems probable that it may be used with more confidence.

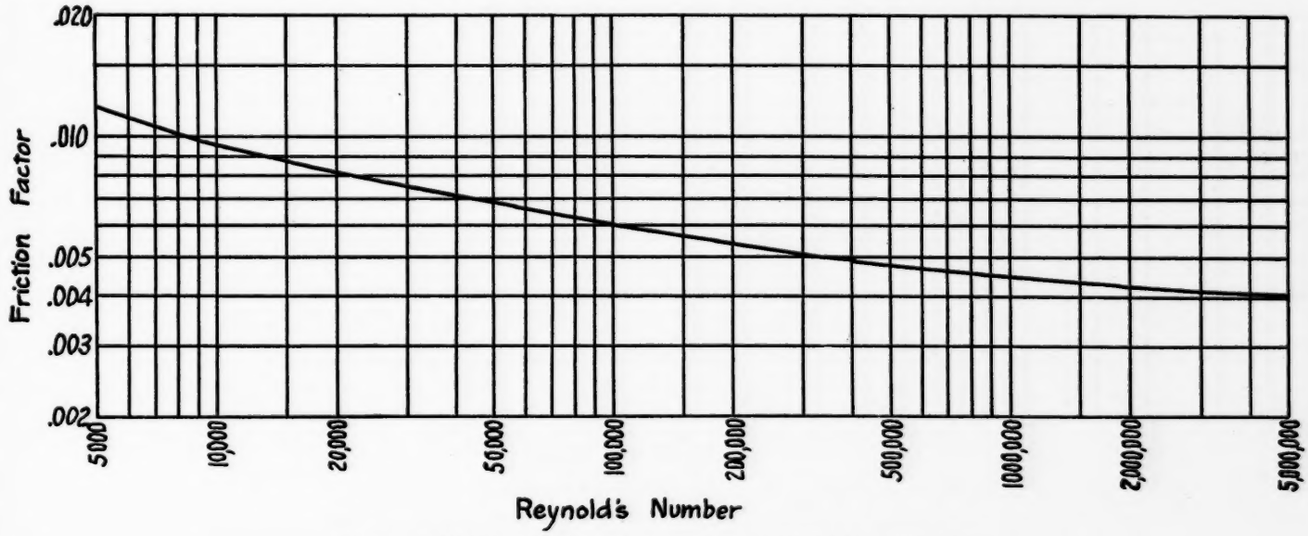


Fig. 3. Friction factors for various Reynold's numbers

Modernizing and Extending a State School Service Plant

By R. W. NOLAND†

THE Fort Wayne State School located in Fort Wayne, Ind., is a state institution, dedicated to the care and training of the feeble-minded. At present the population of the main institution approximates 1500 inmates and 200 employes. The institution occupies a level tract of ground 56 acres in extent and includes over 20 buildings located as indicated on the plot plan.

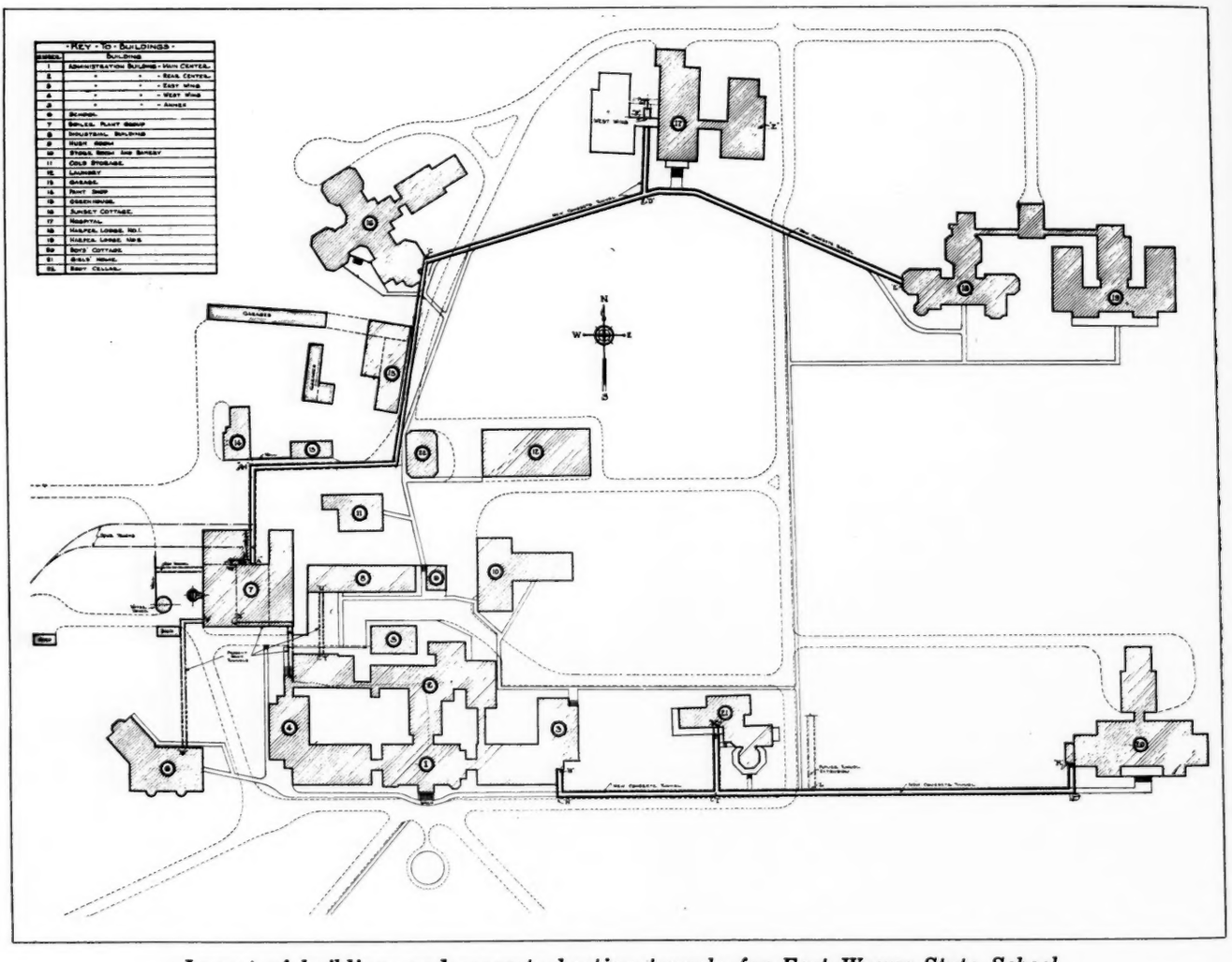
In 1888 construction work was started on the original group of buildings and in 1890 the first inmates were received. The original group of buildings included the present Administration group; the Girls' Home, which was the original hospital; the original power plant group, and a few service buildings. As the demands on the facilities of the institution increased, new buildings were added until the institution reached its present size.

†Consulting Engineer, Fort Wayne, Ind.

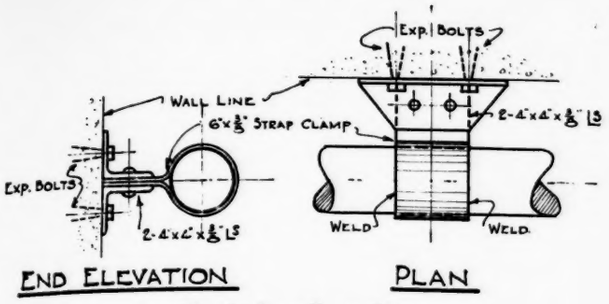
The Old Service Plant

In 1930 a survey of the entire institution was made in order to ascertain the condition of the then existing service plant and to collect basic data from which to design a new or rehabilitated plant.

This survey indicated that the old plant had outlived its period of useful service and that it would be necessary to construct a new boiler plant and distribution system. The old boiler plant included six 150-hp. horizontal return tubular boilers in poor condition set only 24 in. above the grates. The boiler plant building was also in poor condition, but the radial brick chimney was found to be sound and in need of only general repairs. The steam and service hot water distribution systems were in such poor condition that their complete abandonment was recommended. In the older buildings, the heating systems were found to be of obsolete types in need of replacement. In the newer build-



Layout of buildings and concrete heating tunnels for Fort Wayne State School



Typical wall anchor

ings, the heating systems were in fair condition and needed only minor alterations and repairs.

The New Service Plant

The new service plant includes the boiler plant, the complete new tunnel distribution system, new and rehabilitated heating plants in the buildings, and other miscellaneous improvements, the entire extent of which is indicated in the following list.

(a) *Boiler Plant.* Three 300-hp., three-drum bent-tube water-tube boilers having maximum working pressure of 200 lb. Each boiler is fired by a double retort, underfeed stoker having electric motor drive with individual fan at rear, full automatic control, and continuous rating of 600 boiler hp. for each stoker. There are two steam-driven horizontal duplex piston type boiler feed pumps, and full automatic feed water control. A deaerating heater and receiver unit consists of heater mounted on cylindrical receiver, capacity 36,000 lb. of water per hr., 80% of which is condensate return. Boiler feed water is conditioned by a hot process, lime soda equipment consisting of heater, sedimentation tank, vent condenser, filter, chemical proportioner and pump set. For heating service hot water there are two storage tank heaters each 12 ft. long and 48 in. in diameter, thermostatically controlled, capacity of each heater being 3120 gal. per hr., from 45° to 160°. Instruments, which are mounted on a central board, include indicating and integrating steam flow meters, CO_2 recorders, and draft gauges.

(b) *Distribution System.* Concrete tunnels with inside dimensions of 5 ft. 0 in. wide by 6 ft. 8 in. high. Total linear length of concrete tunnels, 3500 ft. Provision is made in the tunnels for (1) main steam supply piping, (2) high-pressure return system, (3) vacuum pump discharge system, (4) service hot water supply, (5) service hot water recirculating system, (6) main electrical distributing system. Existing tunnels connecting the boiler plant with the Administration building plant and the School building were modernized.

The following live steam lines leave the boiler plant: 4-in. full pressure line to laundry; 4-in. full pressure line to old engine room; 4-in. full pressure line to school; 6-in. full pressure line to north group, and 6-in. full pressure line to south group.

The 6-in. line to the north group, the 6-in. line to the south group, and the 4-in. line to the School are each provided with a pressure reducing station within the boiler plant. These stations reduce the pressure in these lines from boiler pressure to approximately 50-lb. gauge pressure in the distribution lines. At the service point in each building served, a pressure reducing station is installed which reduces the pressure in the distribution line down to heating system pressure. All exhaust steam from pumping units is taken through an oil separator to the feed water heater. This system is so arranged that all excess exhaust steam can be used in heating.

The new service hot water distribution system connects the two heaters installed in the boiler plant with every building of the institution. A complete recirculating hot water system connects each building with the recirculating pumps located in the boiler plant. These pumps operate automatically, being actuated by a thermostatic control which is connected into the main recirculating line.

In general the tunnels follow closely the contour of the ground and in nearly all cases tops of the tunnels are used for sidewalks. At low points in the tunnels the steam lines are drained to the high-pressure return lines by means of high-pressure steam traps.

The tunnel system is entirely accessible both from the buildings and from the boiler plant and is provided throughout with an adequate lighting system. Brick ventilators built in above the ground level are located at intervals along the tunnel. Access openings of sufficient size to introduce full lengths of pipe are provided at convenient intervals. The entire piping installation in the tunnels was made during cold weather and after the concrete work of the tunnels was entirely completed.

(c) *New Heating Installations.* (1) In Sunset Cottage, a vacuum steam system, direct radiation, supplemented in day rooms and dormitories by schoolhouse type of unit ventilators. The main hall is heated by means of unit heaters. All radiators in rooms occupied by inmates are protected by wire guards.

(1) In Girls' Home; a vacuum steam system with all heating accomplished by means of direct radiators.

(3) In New Hospital Wing, which was constructed during the time that the new service plant was under construction, heating, plumbing, and wiring systems were designed at that time. The heating system is of the vacuum type with all heating accomplished by means of modern concealed radiators.

(d) *Modernized Heating Systems.* In the following buildings the heating systems were modernized, additional radiation set where necessary and vacuum pump

Construction of the tunnel for heating mains

installations made: Hospital group; Harper Lodge group, Boys' Cottage, and School Building.

The heating system in the Administration group was not modernized as it was in fairly good condition. The return lines from this heating system were rehabilitated and connected into the new vacuum and condensation pump located in the power plant. When new vacuum systems are installed for this group they will be connected into this vacuum pump.

(e) *New Vacuum Pumps.* Individual electric motor-driven vacuum pumps were installed in the separate buildings to serve the heating systems therein. These vacuum pumps are all designed to discharge against a pressure of 20 lb. per sq. in. Each pump discharges into the main vacuum return line which connects directly into the main receiver in the boiler plant. These vacuum pump installations are located at the following points: Pump No. 1—The Boiler Plant (This pump serves the Administration group and the Industrial buildings); Pump No. 2—The School; Pump No. 3—Sunset Cottage; Pump No. 4—Hospital group; Pump No. 5—Harper Lodge group; Pump No. 6—The Boys' Cottage, and Pump No. 7—The Girls' Home.

Reconstructing the Boiler Plant

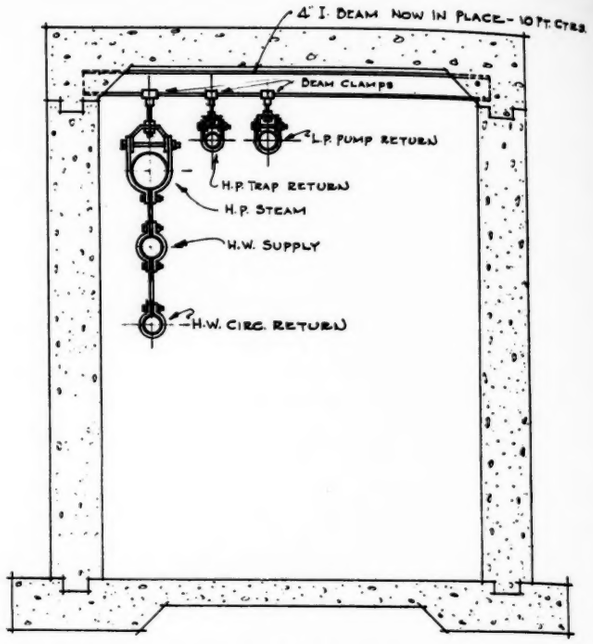
Since the new boiler plant was installed in the same building that housed the old plant, it was necessary to completely remodel the old building. This remodeling was accomplished at about one-fourth of the cost of a new boiler plant building. This remodeling included complete new roof construction of the monitor type carried independently from the old walls by means of steel columns. This roof construction increased the headroom in the plant approximately 12 ft. By supporting the roof independently from the walls, it was possible to raise the height of the walls without endangering their stability. New factory sash windows were installed and the entire building was lined with tile. These alterations converted an apparently obsolete building into a very serviceable and modern boiler plant building.

During the construction of the new boiler plant, the work was so carried on that one boiler of the old plant was in service up until the time that one new boiler was completed and tested out. At no time was the institution without steam. This continuity of service was very important and formed a part of the contract of the boiler plant contractor.

In addition to the saving accomplished by locating the new boiler plant in the old boiler plant building, it was possible to use the old chimney for the new plant. This chimney was built in 1905 and is of radial brick, 7 ft. 0 in. inside diameter by 125 ft. in height. It was found to be in very good condition and was pointed up and rehabilitated at a moderate cost. It is now apparently in as good condition as when it was erected.

Operation

During the coldest weather the peak load which had been observed at the boiler plant is 750 boiler hp. During the coldest months two boilers carry the load, while during the milder portions of the heating season and during the summer one boiler carries the entire load.



Typical section through tunnel showing method of pipe support

The average overall efficiency of the boiler, furnace, and grates approximates 75%. The saving in fuel cost effected by the new boiler plant and distribution system as compared with the old system is 40%. The new boiler plant is operated by one engineer per shift with two inmate helpers. These helpers are employed to handle all coal and ashes. Because of the fact that inmate labor was available and desirable, it was unnecessary to install special coal and ash handling equipment in the plant. All coal is weighed on the boiler room scales before it is shovelled into the stoker hoppers. The coal is handled between the storage and boilers in special hand-propelled cars. A complete daily record of the plant operation is kept by the chief engineer with the aid of the complete boiler room instrument installation. The cheapest grades of Indiana coal are burned very successfully and economically.

Contractors and Equipment

In the construction work inmate labor was used where possible. The institution's mechanics, working under the supervision of the consulting engineer, did the concrete work on the new tunnels, put in all electrical work, and modernizing of the heating systems in the separate buildings.

Contractors were as follows: Boiler plant piping and general equipment as well as heating in hospital addition—Hipskind Heating & Plumbing Co., Fort Wayne, Ind.; North tunnel piping—Lige Heating & Ventilating Co., Auburn, Ind.; South tunnel piping—Schwegman-Witte Co., Fort Wayne, Ind.

Equipment used included the following: Stokers—Detroit; Hot water heaters—Whitlock; Boiler room instruments—Hays-Cochrane; Vacuum pumps—Nash; Vacuum heating specialties—Webster; Concealed radiators—U. S.; Unit heaters—Trane; Unit ventilators—Sturtevant; Pressure reducing valves — Boylston & Fisher; High-pressure traps—Boylston.

Heating and Ventilating

MODERNIZING

A monthly section for promoting the interests of engineers and contractors in the modernizing and renovizing of heating, ventilating, and air conditioning plants in buildings.

APARTMENT HOUSES *ARE* AN OPPORTUNITY FOR MODERNIZING 38

In the past two or three years many apartments have been taken over by banks and building and loan associations. Most of these companies recognize the need for modernizing and have the money for the work. Progressive heating contractors are securing considerable business as a result.

WELDING AS A TOOL ON MODERNIZING JOBS 42

There are many instances when welding can be used to save considerable time and materials on modernizing jobs. Here are a few ways heating contractors are increasing profits through the use of welding.

GAS CONVERSION BURNERS INSTALLED UNDER COOPERATIVE AGREEMENT 43

Cooperation between Chicago heating contractors and utilities on the sale and installation of conversion gas burners has resulted in considerable business for both. Two contractors maintain a separate sales force and claim to have made over 100 installations each.

TWO OLD DWELLINGS MODERNIZED INTO AIR CONDITIONED OFFICE BUILDING 44

Progressive business concerns now readily recognize the benefits to be derived from air conditioning their offices. This modernizing job, in which two dwellings were converted into an office building, called for complete summer and winter air conditioning.

MODERNIZING CONTINUES WITH FHA AND HOLC BOTH BACKING CAMPAIGNS 45

Loans for modernizing under the Federal Housing plan are being made at the rate of $2 million a week, and in addition other agencies, such as the Home Owners Loan Corporation, are lending their support. Progress is being made in obtaining state legislation to permit the operation of Titles II and III of the Housing Act.

Apartment Houses ARE an Opportunity for Modernizing

Here are the highlights of the present situation surrounding apartment house properties, and how material economies as well as increased revenue were brought about in one 80-family apartment through the revamping or modernization of its hot water supply and heating plant.

This is another of a series of articles dealing with opportunities for modernization. It has been written by a man in the field and may well be studied by the heating contractor who is looking for business. Other stories will follow.

WITH all the interest shown in the subject of modernization only relatively little attention has been given to modernization work in the apartment house field. Yet there is a vast amount of modernization work to be done on buildings of this character, especially in the cities and their suburban areas. This is especially true in view of the many buildings which have reverted to the mortgagors during the depression period, who now find themselves "holding the bag" and unable to dispose of these properties owing to market conditions. The low rentals, coupled with high operating or maintenance costs, will naturally make the present owners of these buildings keenly interested in such modernization as will tend to decrease the operating expense and thereby increase the revenue from a better satisfied occupancy.

Reasons why apartment house modernization has not received more consideration are not hard to find. One is that many of these buildings have a reputation for being "cheap stuff" as the mechanical equipment was poorly laid out and installed and the building itself poorly built. This feeling is a carry-over from the period when money was plentiful and so many apartments were built for speculation. The promoter was usually notorious as a chiseler. All he wanted was to erect a building having an attractive front and lobby with apartments that would bring a high rental. Practically no serious consideration was given to the nature of the mechanical equipment nor the construction of the building. He lived in the hope that it would hold together until filled when the building would be sold to or unloaded on an unsuspecting buyer.

In altogether too many cases the builder had no regard for operating costs, because if his plans carried through the property would be sold, as he had no intention of operating the building beyond filling it up for window dressing. The builder wanted a heating system in name only, just a boiler and some radiators —but he wanted to get them at rock bottom. He chiseled on the plans, on the equipment, its installation, on the contract, and on the payments. Whether the system worked and was efficient did not enter into the consideration. To most of us these practices are still a sore spot and most of us are still wary about any kind of apartment house work.

Then, too, through the depression years we have all known that the apartment house owner was a harassed individual. Seldom was he an experienced operator and in the face of falling prices and increased vacancies he had no adequate defense. He gained the reputation of being broke, and therefore there was no use expecting him to do any modernizing no matter how well he and everyone else knew it was needed, knew that his heating plant was costing him needless expense, and knew that the developments which have come along in heating were so outstanding that his plant was becoming more and more obsolete by the month.

Under these conditions it was perfectly true that there was no modernizing work to be done in apartment houses.

New Situation Now

Now, however, this situation has changed to a substantial degree. In the course of the past two or three years, foreclosure proceedings have resulted in apartment properties passing into the ownership of banks, trust companies, insurance companies, and building and loan associations. None of these institutions were organized to own and operate apartment houses; their function originally was to lend, not to operate. Finding themselves rather suddenly in possession of extensive properties, they had to take counsel as to what should be done. There were only two courses—either to sell the buildings at once for what they would bring or else arrange to operate them. In the absence of a market, sale was, and still is, out of the question. At prevailing rentals there is too little margin in apartment house operation to make their ownership such an attractive investment that investors care to put money in them. This left operation as the only recourse to the new owner. Here is where things stand at present, with these institutions the more or less involuntary owners, forced to operate, and without either adequate operating experience or operating staffs.

The first reaction seems to have been to regard the operation as purely a passing phase and as something to be done only temporarily. Recently, though, many responsible executives have come to see clearly that this operation may extend over quite a period. Also they are now painfully aware that operating an apartment property at a profit under present conditions is not simple. Any methods for increasing income or decreasing operating expense are worth careful study.

Fig. 1. The result of modernizing and good operation of an apartment house—95% occupancy.

How Modernizing Fits In

Modernizing the heating plant fits ideally into this situation. It is the one thing a management can do which, if practiced properly, will result in accomplishing both objectives at one and the same time. Consider, for instance, painting or decorating. They will perhaps help to increase income but they do not reduce operating expense at the same time. The same is true of every other plan for increasing income. Heating, therefore, is especially appropriate in any modernizing which the management may be able to undertake.

In spite of all this, modernizing of the heating plants in apartment houses has not yet got going to anything like the extent which might normally be expected. Two conditions have prevented this enormous potential from being translated into actual work. One reason has been financial and the other is a lack of understanding of what is really available in heating practice.

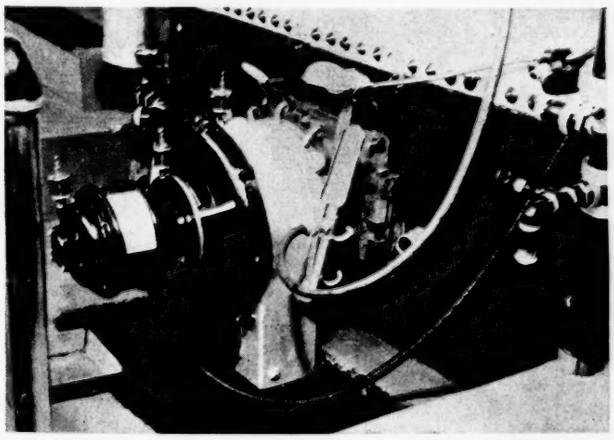
On the financial side, few houses have been meeting expenses, loans were almost impossible by individual owners, and they preferred to hang on rather than to borrow in order to spend anything on the properties. With so much apartment property now in strong financial hands, with FHA and other loans available, and with the demand for rentable space slowly asserting itself, the financial drawbacks are now largely removed. It is entirely reasonable to believe that so far as purely financial reasons are concerned, apartment house owners generally will be able to go ahead with modernizing during the coming summer.

From the standpoint of lack of understanding of present day heating there is still much to be desired, and much to be done if managements are to take advantage of the benefits of the improvements in heating which have taken place during the depression. Air conditioning has received so much attention and so much general publicity that it has tended to obscure the real advances which have been made in steam and hot water heating, in combustion and burning devices, in controls, and in improved operating methods. On these points many owners are badly in need of reliable and disinterested advice. They need engineers, but these engineers must be thoroughly practical and strictly up to date on methods and costs. Probably few managements know or fully appreciate the savings possible. With even the best of 1928-29 plants it can confidently be predicted that competent engineers or contractors can devise ways of accomplishing savings up to 25% by a careful study and choice of suitable means. With older plants, or with plants which were typical of those put into apartment houses at that time, savings up to 50% of the fuel are not at all beyond expectation. Where these economies can be made at expenditures that will be amortized out of savings accruing in two years, they offer as good a return on an investment as is available anywhere. These cases will not be fully revealed until they are investigated. It is up to us to find means of making such studies in order that owners may really understand and appreciate.

A Case in Point

Throughout the depression there have been some owners of apartments so well managed that they have been in position to keep their properties in shape. These owners have pursued a farsighted policy. What apartment modernizing has been done has been theirs. It is to such cases that we must refer to illustrate what can be and has been done.

Take the case of the house in Newark, N. J., known as 321 Mt. Prospect Avenue. This is a house of 82 apartments, 6 stores, 96 baths, 186 rooms, and 752,762 cu. ft. of volume. It is a six-story brick building erected in 1929, and operated for a while by the original owner. When renting conditions became difficult the owner was not successful in his efforts to keep the house filled,



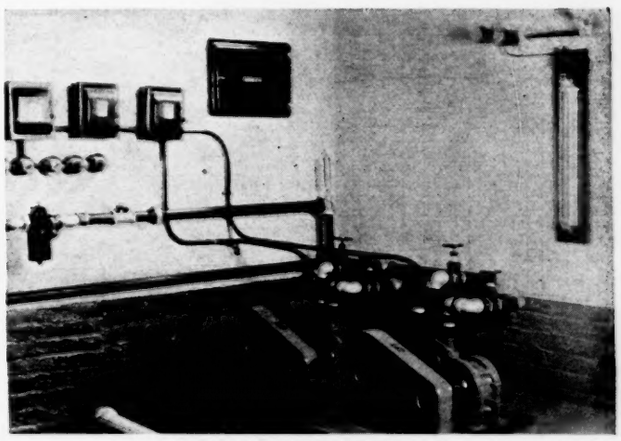


Fig. 2. (Left) Manually-operated oil burner using No. 6 oil which provides heat for apartments and hot water.
Fig. 3. (Right) Rotary pumps force oil from tanks to burner.

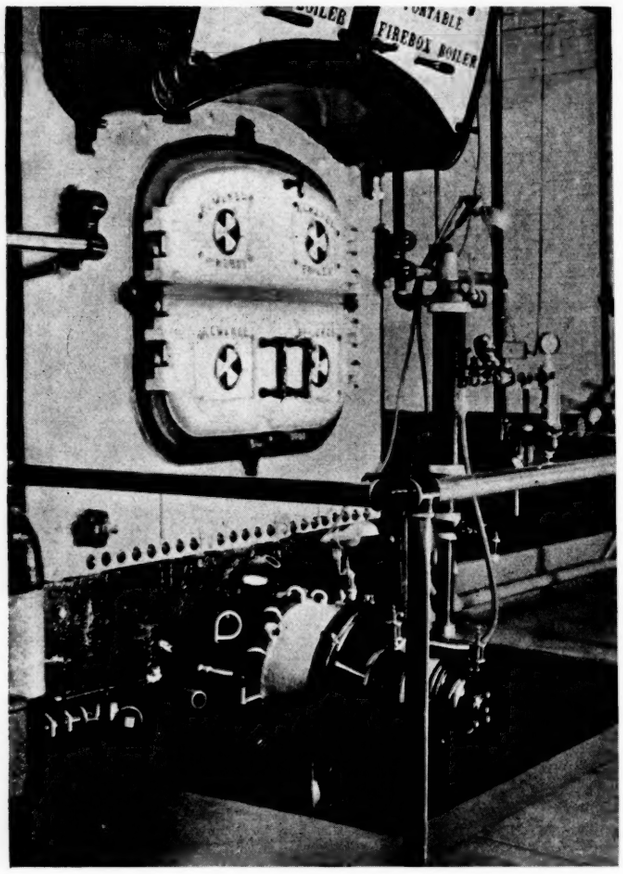


Fig. 4. Neat appearance of the boiler room has been a powerful factor in the decision of tenants to take space

service became lax, rentals were reduced, and the house developed a questionable reputation. This continued until the owner was not able to meet fixed charges, and eventually the building came into possession of a building and loan association[1] in 1931 through foreclosure proceedings to protect the mortgage interest.

[1]The Eleventh Ward Building and Loan Association, 487 Orange St., Newark, N. J.

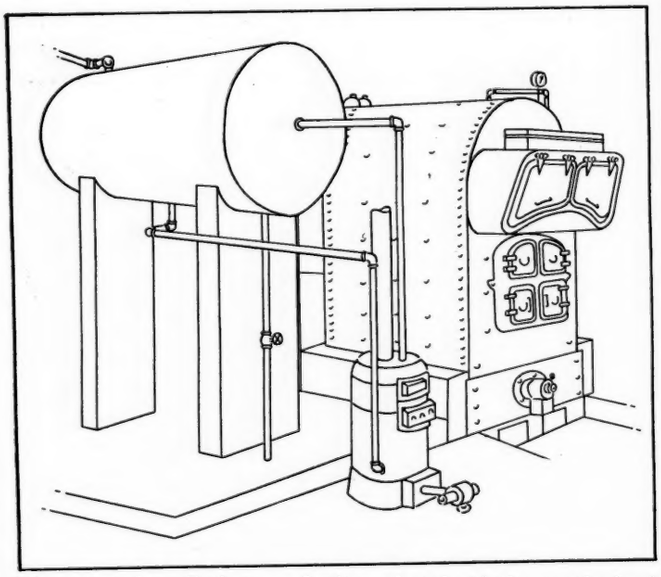
The heating plant put in at the time of erection reflected the ideas then current in apartment house heating. A one-pipe steam system having about 15,000 sq. ft. of direct radiator was served by a horizontal return tubular fire-box steel boiler in the basement. A rotary oil burner fired with No. 6 oil (preheated) was under pressure control. Alongside the boiler an elevated horizontal 3000-gal. insulated steel storage tank was connected to a water heater fired by an oil burner using No. 4 oil. This burner operated under control of an aquastat. With this arrangement the heating plant and the hot water supply system were entirely independent of each other. Fig. 5 shows diagrammatically the arrangement of the boiler room. This room is located in one end of the building and was kept in the condition too often typical of such places. It was neither painted nor otherwise dressed up; cleanliness and neatness were not at a premium.

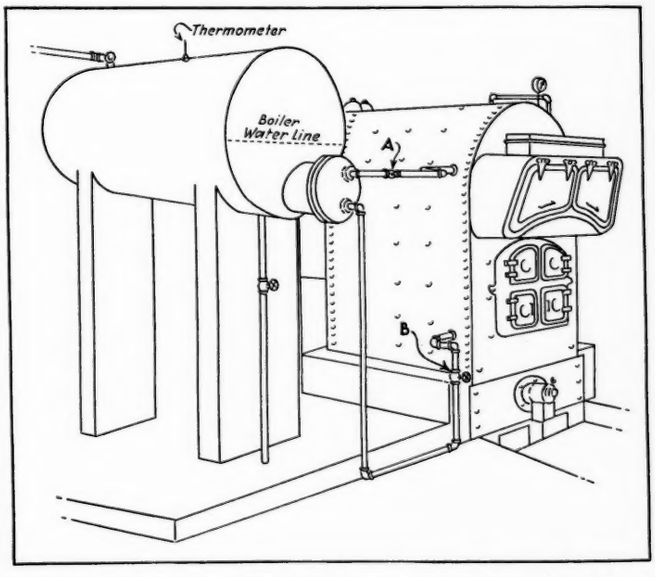
Things Begin to Pick Up

When possession of the building passed into the hands of the association, immediate steps were taken to rehabilitate it and put it on a sound operating procedure. It was realized that the services and surroundings must be above reproach. William Grover, the present manager, took charge in February, 1932. Among other things, the heating system was examined and repaired but no major changes were made. The boiler room was painted, including floor, side-walls and ceiling, and otherwise put into attractive condition, and opened to tenants and whoever wished to enter.

With these changes the building continued to operate while efforts at securing highly desirable tenants and increasing the effectiveness of the service were showing results. Income increased and vacancies diminished. Operating records were kept from which costs could be determined, and the nature of tenant complaints could be analyzed. This condition continued through 1933.

When enough operating records had accumulated to





Figs. 5 and 6. Before and after sketch of the method of heating hot water. Small oil-burning boiler using No. 4 oil was replaced by a submerged hot water coil connected to heating boiler.

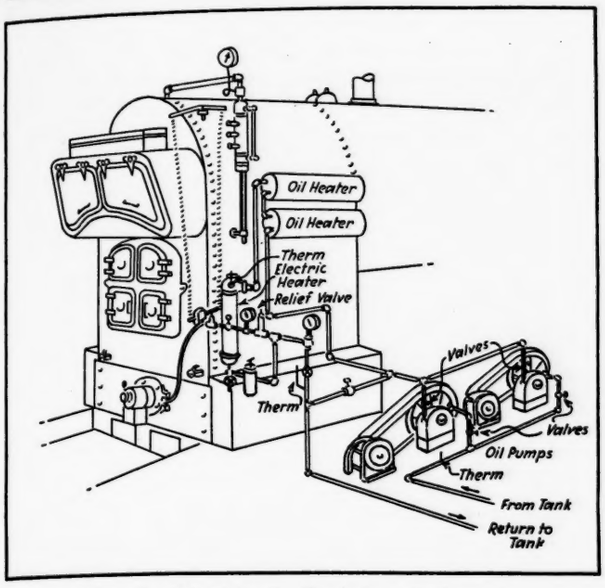


Fig. 7. Sketch of oil piping to burner.

permit analysis, examination brought out the fact that all was not well with the hot water supply situation. Additional careful study was given to this, and eventually it was decided that outside advice should be obtained. As a result a survey of the building was made, and the decision reached that substantial changes be made.

Boiler Room is Modernized

As finally agreed upon, after cooperative efforts on the part of all concerned, the boiler room arrangement was revamped as shown in diagram in Fig. 6. It will be noticed that the principal change consisted of an arrangement whereby the separately-fired water heater was eliminated. To do this a heating coil was inserted into the storage tank below the water line of the heating boiler. In this way the one oil burner takes care of both the heating load and the hot water load. Use of the higher-priced No. 4 oil is eliminated entirely.

Reference to Fig. 6 permits an understanding of the method of operation. During the heating season the oil burner operates under control of the boiler pressure. There is no zoning and no thermostatic controls on the heating system. Pressure is maintained on the boiler throughout the heating season and 24-hr. heating is practiced. Occasional hand adjustment of the valves A and B in the hot water lines permits keeping the water in the storage at 140°. With the large storage capacity the rate of heating is small and only relatively little if any additional capacity is required by the boiler since the hot water heating takes place almost altogether during hours when the boiler is off peak. In the summer months, the heating system is closed off by closing valves in the main above the boilers and the burner is operated long enough each day under hand control to keep an adequate supply of hot water in the storage tank. Usually this is accomplished by operating the burner for a period of about a half hour three times each day.

When the boiler room changes were being made, piping between the oil storage tank and the burner was rearranged in accordance with Fig. 7, and additional oil preheating surface was installed. Oil pumps are of the rotary type and being in duplicate, one operates steadily while the other is held for emergency use. The pump operates at constant speed and maintains a substantially steady pressure in the supply piping. The pressure relief valve is spring-loaded and adjustable by hand. The oil supply system is thus of the preheating and recirculating type, the excess pumpage passing through the relief valve and returning to the tank. During operation a constant pressure is kept on the gauge in the supply line to the burner.

Boiler Room is Dressed Up

Following completion of the boiler room changes, the entire room was put into spick and span condition by the liberal use of paint. It is kept spotlessly clean and shipshape. Brass rails and fittings are polished and shining. The whole room presents that appearance dear to the eye of marine engineers and often found in large power stations, but seldom in the boiler rooms of apartment houses. There is adequate lighting and fixtures are of good quality and design. A neat log table is provided and daily operating records are kept and closely followed.

Results

As is to be expected, there are two kinds of results. One kind is shown partly by the interest which tenants take in the boiler room. It is not at all uncommon for tenants to bring their guests to the room and they take pride in showing it off. Prospective tenants are shown through the room and note its features with as much

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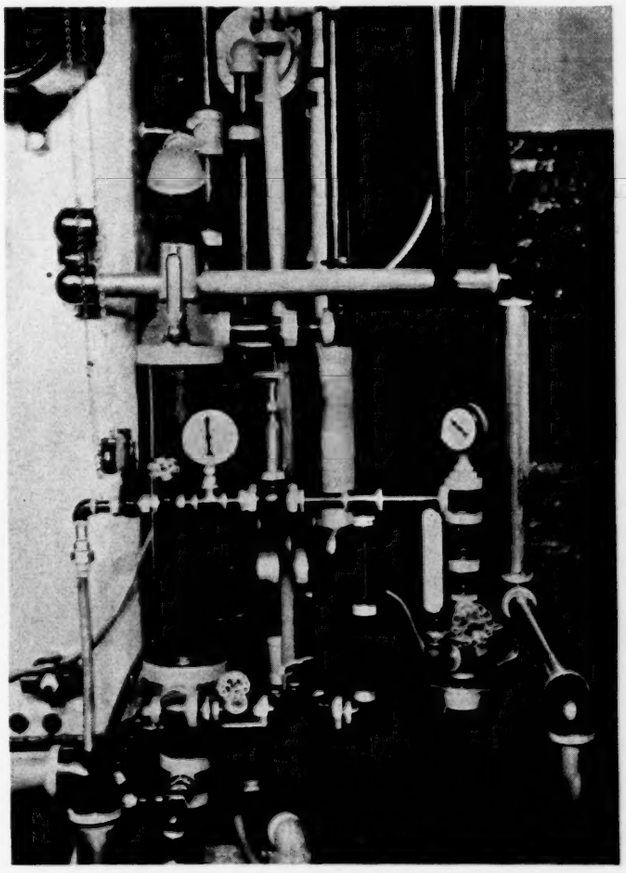


Fig. 8. Heaters and controls for oil burner.

Welding as a Tool on Modernizing Jobs

As heating and ventilating modernizing contracts grow in number and in size, holding man-hours and materials down to a minimum gathers fresh importance in view of the highly competitive nature of bidding. Welding has ceased to be either new or mysterious to the average engineer and contractor. It has earned a well-deserved place in the erection of new equipment in new buildings. Now the gathering momentum of modernization work indicates that in this class of contract, there are many instances where it can be used profitably.

Consider, as a simple instance, the matter of adding another heat riser or two, plus, perhaps, a dozen new radiators to supplement an existing system. This is a common contract at this time. One can quickly cut the necessary opening in the main at the desired point, fit the branch to the hole, weld it in, and up goes the riser. If there are lateral connections to be made, as there usually are, much the same operation can be followed wherever new radiators are required. The job is permanently tight and time and materials can often be substantially cut.

Another operation wherein welding applies aptly is in the addition of new radiators to old branches between floor and ceiling. Instead of having to tear up long lengths of flooring, as used to be done in such cases, one needs to remove only short sections of flooring to expose branch lines that are to receive the new radiators.

Again, where existing pipes are closely nested and wrenches can be used only with difficulty, the welding method of fastening is a boon to contractors. Many times wrenches and tongs cannot be used at all unless piping is removed. Yet, the welder simply points his torch at the point where the connection is to be made, cuts the hole and welds on the new fitting.

The engineer who specifies welding usually can be certain that new heating and ventilation, added to old systems by welding, results in permanently tight work. Since tightness is almost wholly a matter of quality of workmanship the engineer can satisfy himself on this point, and then at least make the use of welding optional with the contractor. In modernizing jobs where exact locations of existing piping and concealed obstructions cannot be determined in advance, optional specifications have an added argument.

An interesting instance of the time which can be saved occurred recently in a large school building wherein a serious leak occurred in a 6-in. steam supply main. As the trouble was not noted until the morning warm-up, "after-hours" repairs were impossible. The operator accordingly ordered steam shut off through the building at 9 a.m., pulled his fires and arranged for the heating contractor to get on the job at once.

Insulation was stripped from a considerable portion of the main, and by 10 a.m. the pipe had cooled sufficiently so that repairs could be begun. Using a cutting blowpipe, a cut was made through the 6-in. main. The leaky section was cut out and lowered in one piece to the boiler room floor where it served as a pattern for making up a new pipe section.

The new pipe, however, was cut 1 in. longer, was then hoisted to position and by spreading the existing main a little was squeezed into place. Thus held in position three tack welds in each joint were made and the entire joint closed without delay in the manner indicated in the accompanying illustration.

A new 2½-in. branch also was added at the same time. After first cutting to correct size and mitering on the floor of the boiler room, the branch was welded into position as shown. In joining the branch to the main it was necessary to make a templet mark on the main. The necessary hole then was cut in the main, the branch inserted and welded in. Steam was turned into the system at 3 p.m., the same day.

The foregoing, and other similar cases that might be cited, serve to emphasize the all-round usefulness of

(Left) A leaking fitting in a steam heating main was eliminated in 6 hr. by cutting out the faulty section and welding in a new section. (Right) With the branch connection joined to the main the welder finishes the job by welding the branch, old and new parts together.

welding equipment both on planned modernizing and on emergency calls for heating work.

Not long ago a prominent contractor was asked to connect the boiler feed line to the heating return. Ordinarily it would have been necessary to unscrew the 2½-in. return, cut, rethread, install new fitting and reducer to accommodate the ¾-in. feed water line. Instead, by using welding equipment, the fitter simply cut the necessary hole in the 2½-in. return, brought the ¾-in. line to it, and welded them together. The time saved was held by the contractor to be one-half day.

Although jobs of the sort just described often do not prove highly profitable under any conditions, nevertheless, when one welds he does the work in the quickest and cheapest possible way.

Another factor when using welding is the absence of large quantities of short pieces of pipe and other refuse generally considered as salvage. Due to ability to weld lines in random lengths, instead of all full lengths to reduce the number of fittings required, typical of screwed work, contractors hold their salvage loss at a minimum. One prominent contractor (his organization handled $2 million worth of work in a single year), expressing himself on this point, stated that after one of his largest contracts the junk man received only 200 lb. of pipe ends.

Modernization is bringing to light some very old and highly corroded piping. Many lines have been untouched for 10 years or more. All contractors know the trouble incident to unscrewing old joints. Often wrench pressure, necessary in the unscrewing, forces the renewal of entire lengths of pipe which the contractor had not included in his estimate. If he is operating on a cost plus basis this may not be unwelcome. In the usual case, though, he has to furnish and install more material than he bargained for. Welding prevents losses of this nature.

Let the blowtorch cut the lines at the points desired, all healthy parts to remain undisturbed. Insert new fittings and new connections as needed. There need be no loss due to furnishing unexpected materials.

We all know that summer is the appropriate time to modernize heating and ventilating. Yet, it looks as though the winter months will bring to the fore considerable remodeling, often in buildings such as hospitals wherein steam shutdowns may be impossible if institutions are to operate at anything like full-time service.

A metropolitan contractor recently handled just such an installation, where two new wings were added to an old hospital. There was to be no shutdown. The heating and ventilating contract amounted to about $400,000 and included comprehensive changes. The old power house, for instance, became the new pump room. The old pump room became a new engine room, and the old engine room became a new refrigeration room. Four new engines and four new boilers were added, the former as replacements. After many weeks of work, progress reached the engine changeover, regarded as the keystone of the ability of the hot water and heating systems to function. With the aid of welding the four engines were changed over in 4 hr., an operation, states the contractor, that ordinarily would have required about two days.

Smoke breeching changes, the addition of air conditioning to ventilating and heating systems, the modernization of refrigerated drinking water systems, and kindred work regularly encountered in modernization finds welding invaluable.

Sometimes such improvements find existing lines flush with walls, so tight, in fact, that wrench work would be impossible. Welding overcomes such difficulties easily if fitters just cut out a V-shaped segment from the old pipe, join the new line by welding the inner, or peak of the junction from the front, that is, through the V-shaped aperture, then replace the V-piece and fuse it into its correct position to make a tight joint. It is frequently little tricks like this that prevent constructional losses and, instead, bring profit in handling modernization contracts. Welding apparatus may prove virtually indispensable. At any rate the contractor who is not prepared to use it is at a disadvantage.

Gas Conversion Burners Installed Under Cooperative Agreement

THAT heating contractors and utility companies can work out cooperative arrangements mutually beneficial is shown by the way in which installation of conversion gas burners has been handled in Chicago. Since September, 1933, some 12,000 of such installations have been made in the Chicago territory and a considerable number has been handled by established heating contractors. With new building work at a low ebb this work has been responsible for keeping many important heating contractors busy since each installation requires from 12 to 14 hr. of work. There are said to be some 70 contractors engaged in this work now.

The cooperative plan provides that contractors can act both as dealers and installers. Prices paid for installation work were agreed upon after a series of conferences between representatives of utilities and the contractors. Several meetings of the Chicago Master Steam Fitters Association have been attended by representatives of the utilities. Two schools were held for the purpose of providing training in making these installations during which thorough instruction was given in the mechanics of the conversion burner, and also in sales methods. It is reported that the plan can definitely be shown to have benefited both groups. Two heating contractors claim to have made upward of 100 installations each and at least one has become something of a specialist in handling gas installations. This particular firm has gone so far as to maintain a separate sales force to promote the use of gas for building heating.

Two Old Dwellings Modernized into Air Conditioned Office Building

AN example of up-to-the-minute modernizing, with complete air conditioning, is the new office building at 210-12 Newbury St., Boston. Two old dwellings with brick fronts, bay windows, old-fashioned deep closets, and dingy coal cellars were recently converted into a thoroughly modern office building, having sound absorbent ceilings, modern lighting, and automatically-controlled air conditioning for the use of an organization which furnishes information on business conditions for thousands of clients.

In starting to modernize these structures, which were to be thrown into one, rough blueprints of proposed changes were submitted to every employe, and prizes were offered for suggestions that would make for efficiency in layout or details. There was much interest in the project, some excellent suggestions were made and adopted with the award of prizes.

In remodelling, the brick fronts and bay windows were torn away, the fronts straightened and faced with a handsome light stone. Two retail stores were located on the street floor, with offices on the next three floors above, reached from a private entrance, with a shipping door and parking space at the rear. Floors were strengthened with steel beams and the upper floors laid out in a well thought out plan by which work flows smoothly from one executive to the next and through the various departments down to the mailing room, located in what was formerly the cellar of one of the houses, now as light and airy as any of the upper floors.

As much as possible of the old structures was retained, but wallpaper was removed, walls refaced and painted, new partitions put up, and a complete modern lighting system installed.

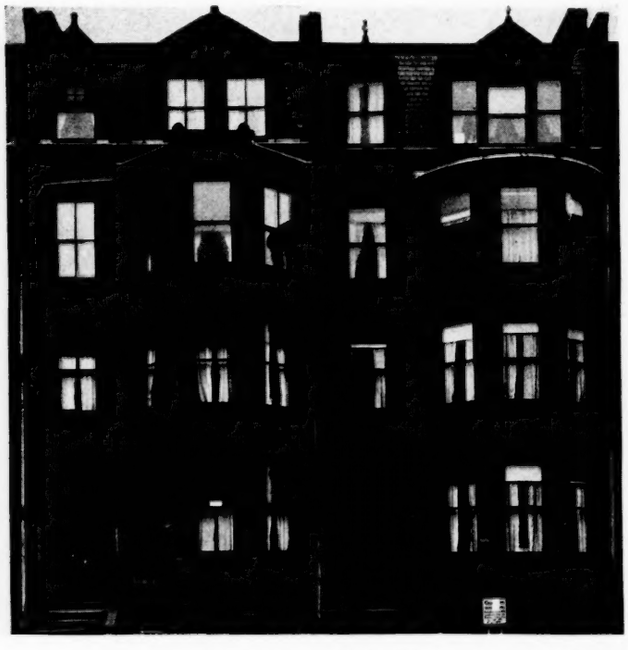
Heat is supplied through a connection with district underground steam mains at the sidewalk, in two independent systems, one for the stores and the other for the offices above. Direct radiation is provided for the stores.

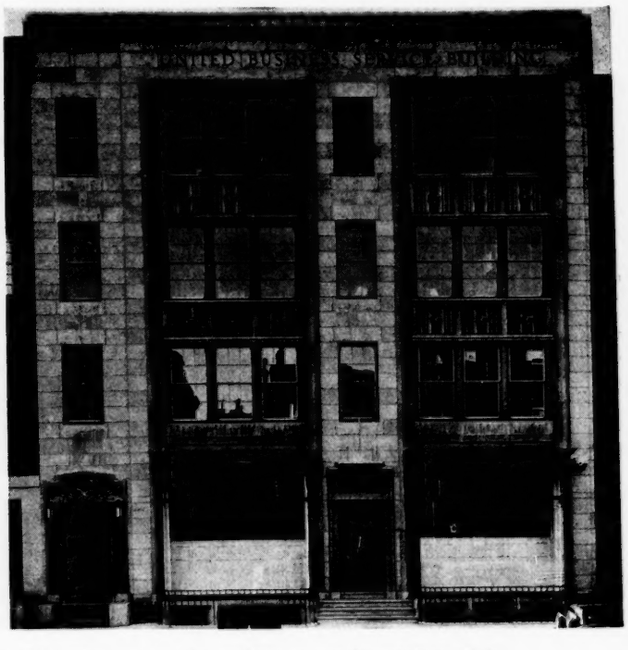
Three conditioners, located in former clothes closets, serve the offices. The conditioned air is carried through ducts, and each floor is provided with independent, automatic regulation. Ducts can be adjusted within the walls for each office separately, and the temperatures may be kept as desired in each room.

In mild weather the heat can be shut off at the main intake and outdoor air can be circulated as desired by the fan system. Direct radiation is used for toilets, and those with inside location open into wells with fans exhausting outdoors.

In summer, heat can be shut off and the system switched to the cooling and humidifying system, powered by two 5-hp. compressors and one of 3 hp. A separate refrigerator provides cold drinking water at all times. In some rooms conditioned air inlets are located in the ceilings, with returns on the lower walls, or under the doors. On the top floor, inlets and returns are about the same level.

Building is occupied by National Business Service, and the space is substantially greater than that used previously—an increase made necessary by a growth of business achieved during a period when business and investments were at a low level.





A complete air conditioning system helped make this an up-to-the-minute modernizing job

Modernizing Continues with FHA and HOLC Both Backing Campaigns

and with possibility of rural modernizing. State legislation to aid Titles II and III

JANUARY indicated no let-up in the modernization and repair activity created by the Better Housing Program of FHA. In defiance of a season that is generally a dull one for any kind of building work, loans for modernization and repair purposes are still being reported at the rate of $1½ million a week. The total amount of loans under the modernization credit plan reported up to January 19, was $34,647,310, or an increase of $1,464,583 over the preceding week. 82,316 loans had been reported to January 19, making the week's increase 3,330.

The amount of uninsured loans and of cash work created by the program is, of course, far in excess of the insured loans, and is estimated at $213,834,751 up to January 19. Ninety-nine new contracts were issued during the week to financial institutions, entitling them to lend under the modernization plan, bringing the total number of approved institutions to 12,172. There were, as of January 19, 5,201 community Better Housing Campaigns organized or in the process of organization. This represented an increase of 123 communities over the previous week's total.

It is reported that at the opening of the year about 11% of all FHA modernizing contracts were for heating; that all this work had been done by somewhat less than 6000 contractors; that of the 6000 contractors 26%, or 1560, had had two or more FHA contracts. Average value per contract is still running about $400.

Title III

In order to make it possible for the government to put into effect Titles II and III of the National Housing Act it will be necessary to have a large number of state laws amended so as to do away with the statutory limitations upon loans and investments by banks, insurance companies, building and loan associations, trust companies, fiduciaries, and other investors which are now restricted in making insured mortgage loans, and investing in insured mortgages and in national mortgage association obligations, as provided by the National Housing Act.

President Roosevelt announced January 20 that the governors of 38 states have approved his suggestion that this legislation be enacted immediately. Of the remaining 10 states, the governors of Arizona, California, Delaware, Indiana, Kansas, and New Jersey have not replied to the President. Of the remaining four, New York[1] and Ohio already have such laws, while the legislatures of Kentucky and Virginia are not in session.

Master Specifications

For the protection of half a million families whose homes have been refinanced and are being put in proper repair by the Home Owners' Loan Corporation, HOLC issued late in January a 32-page compilation of "master specifications" for its home-reconditioning work. The requirements are designed to safeguard the homeowner against questionable workmanship and materials by guiding contractors in the reconditioning of homes which are security for loans granted by the corporation.

To date, a cash expenditure of approximately $45,000,000 is represented in reconditioning work completed or under way through this corporation alone, on about 250,000 homes, bringing increased activity to the construction trades in all sections of the country. As of January 10, the corporation had closed refinancing loans on 747,676 homes throughout the country, to an aggregate of $2,261,585,353.

According to HOLC, the reconditioning operations of the corporation will not be permitted to serve for experiments with untested ideas in architecture, building materials, or construction. It is claimed that one object of the reconditioning work of the corporation is to set protective standards which will be an incentive to homeowners who are not served by the corporation to make their own homes more valuable and more enjoyable.

While eliminating sub-standard products, the specifications permit the widest choice of materials so long as they are used properly and are suitable for the job under consideration. Sources drawn on by the Reconditioning Division of the corporation in preparing the master specifications include the United States Bureau of Standards, the American Society for Testing Materials, and practical recommendations from its own field offices throughout the country.

Minimum standards are established for heating, plumbing, chimneys and fireplaces, lumber, cement, carpentry, painting and wall papering, electric wiring, thermal insulation, and weatherstripping.

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[1]As a matter of fact, New York's law is being used as a model by other states.

Burner Men Define Cost,

propose other modifications to oil burner code at NRA hearing. Pump makers attend hearing

UP until 1934 the oil burner group was probably the most fortunate of the many which make up the heating and air conditioning industry. At least this was true to the extent that burner sales held up during depression years far better than did those of other equipments. But 1934 brought three new troubles: oil price increases, which slowed down burner sales, gave impetus to stoker sales; competition of independent dealers with oil companies seeking the fuel business[1], and the failure of the oil burner code.

With the collapse of the code, many burner men proposed that the whole thing be dropped. This, it was soon pointed out, was not possible. Since then the industry has been wrestling with its code, proposing a modification here, an amendment there. To discuss these changes, NRA held a hearing in Washington January 10.

Amendments to make the oil code workable were offered by A. W. Clark, acting secretary of the Code Authority, and were explained by Mr. Clark and A. J. Fleishmann, chairman of the Code Authority.

It was proposed to eliminate part of Article 3 which defines the various classes of oil-burning equipment so as to eliminate distillate oil burners. The distillate oil burner industry is now operating under its own code.

Article 3, Section B, it was recommended, should read as follows, the italicized words being inserted under the proposal: "Dealers or persons, including, but not limited to, individuals, partnerships, associations, or corporations operating under a contract and/or franchise, *or otherwise*, with a manufacturer or distributor, and whose oil burner business is the sale of oil burners at retail."

This wording was recommended because some dealers had claimed they did not come under the jurisdiction of the Code Authority since they (the dealers) were not working under a contract or franchise. The insertion of the phrase "or otherwise" will include such dealers.

Another proposal was that a paragraph 3F be added to Article 4 which deals with labor provisions. The suggested addition reads: "Every employer shall make reasonable provision for the safety and health of his employes at a place and during the hours of their employment. Standards for safety and health shall be submitted by the Code Authority to the National Industrial Recovery Board for approval within six months after the effective date of this amendment. The standards approved shall be part of this Code and enforceable as such."

This paragraph is common to most codes and its addition is proposed merely to bring the code up-to-date.

Article 5 of the present code deals with cost provisions and provides that no member of the industry shall sell at a price below his cost. A cost system was worked up a year ago by a firm of certified public accountants, but although three attempts were made to obtain approval from NRA, approval was never made. Consequently, a new section dealing with cost provisions was proposed with the hope that it might be more workable.

The new Section 5 would place on NRA the responsibility of enforcement rather than leave it to the Code Authority. Furthermore, the old paragraph called for filing a minimum price which was not necessarily the price at which most of the product was sold. The result was in some cases to depress prices in the industry as much as 8% to 11%. The proposal makes it a violation of the code to sell below cost, and outlined the items which make up cost in both the manufacturing and retail end of the business. These are: *Manufacturing:* Material; labor; cost of distribution; factory overhead and administration (both adjusted for rate of operation). Administration not to include interest; depreciation on unused facilities; development expense including license fees, laboratory fees, laboratory tests and patent fees.

Retail: includes material; labor; delivery expense; permit and inspection fees; sales expense; office wages: partners' and officers' salaries; rent; light; heat and maintenance service at actual cost.

It was pointed out that by including these items the practice of fuel oil distributors charging off burner costs against fuel oil would be eliminated.

Other changes were more or less minor and included the dropping of one or two paragraphs which referred to the distillate oil burner business.

Mr. Fleishmann reported that at a meeting of the representatives of manufacturers and distributors of the industry held in Detroit January 7 all of these amendments had been presented there and no objections had been raised.[2]

Mr. Clark, speaking as executive director of NOBDA, said that wide publicity had been given the amendment among oil burner dealers who had raised no objections to them.

Following this the meeting was adjourned. The decision as to whether the amendments will be allowed will be given later.

Two days following this meeting the Code Authority for the Oil Burner Industry applied to NRA for approval of a $24,625 budget to cover the expense of administering the code from December 17, 1934 to June 16, 1935.

The proposed basis of contribution on products of the industry as defined by the code would be 50 cents each for conversion type oil burners and $1 each for combination oil-burning boiler-burner units. Fifty per cent of the assessment would be charged against the manufacture and 50% against the dealer or distributor.

Pump Manufacturing

A meeting was held by members of the pump industry on January 4. This meeting was requested by the supervisory agency of that industry to interpret Article 2 of the Code. An interpretation was requested as to whether the manufacture and sale of pumps solely for use either as an original or as a replacement part of the product of another industry is or is not subject to the provisions of the pump code. The specific question involved was that certain pump manufacturers who made pumps included in other appliances, such as, for example, fire-fighting apparatus, held that they should come under other codes, such as the Fire-Fighting Apparatus code and not under the Pump Manufacturing Code.

No decision has as yet been made by NRA.

Register Manufacturing

The code authority for the warm-air register manufacturing industry has applied to NRA for approval of its budget, covering the period from July 19, 1934 to January 19, 1935. The budget, which amounts to $2500, is based on an estimated sales volume of $1 million for 1933 with the basis of contribution at ½ of 1%.

[1]On complaint of the National Oil Burner Dealers Association, the Federal Trade Commission began on Jan. 15 an investigation into the oil burner marketing policy of Standard Oil Company of N. J. and Gilbert & Barker Mfg. Co.

[2]At that meeting the following resolution was adopted: "Resolved, that it is the sense of those present at this Conference that the Oil Burner Industry should operate under its own Code of Fair Practice as heretofore prepared and at present in effect, with such amendments thereto as may be adopted, and that the Industry assures the Code Authority of its cordial support."

EDITORIALS

Outlook for Modernizing

There have been two viewpoints frequently expressed about the course of the modernizing movement. One is essentially pessimistic while the other is the reverse. A considerable group has never been able to "see" modernizing as a practical and real source of desirable work. The others—the enthusiasts—cannot see anything else for some time to come.

For a long time the doubters had all the better of the discussion. In spite of drives and efforts of all kinds, modernizing projects were hard to find and still harder to turn into anything resembling activity.

Last year following the start of FHA and its publicity campaign a substantial amount of work began to show. Not as much as had been expected by the enthusiasts, but more than had been conceded by the doubters.

Now we come to the question of the outlook, or the prospects.

Our own belief is that they are good. We believe this is true because the essential conditions to promote this kind of work are now at hand. We believe that FHA has done a good job to date. We believe that its full effect is still to be felt. More and more existing commercial and apartment buildings are getting on their feet. Inflated values are being brought down to a point where there is some hope. It looks very much as though these factors will bring their weight to bear this summer. To any who are still holding back on getting into modernizing the word is—you're probably overlooking something.

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Studies of Air Conditioning Effects

In the three or four years since air conditioning began to receive intensive publicity, there has been a remarkable increase in the number of studies of its effects which have been started. We are continually hearing how this and that agency or organization has decided to study some phase of the subject. It is said that there are projects under way to learn the effects on office workers, on factory help, on colds, on hay fever, on pneumonia, on seed germination, on textiles and similar materials.

Most of these studies are slow, and while we hear of their being started, we wait a long time to find out the results. They will come along in due time though, for only recently partial results were reported on two such widely different subjects as egg-laying and wheat-growing. It appears that at least some hens are inspired to greater efforts when they are humidified, while addition of CO_2 to the natural air has an important effect on wheat-growing.

These two bits of information, both of which are preliminary, contain such possibilities that they stagger the imagination. Truly this subject of air conditioning is broad. If it is still puzzling in its engineering aspects, take consolation in the fact that its basic effects are still more puzzling to plenty of other people.

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Marketing—An Engineering Problem

Marketing technique and marketing problems and procedures have come to occupy a position of growing importance in commerce. Marketing affects everyone in the whole economic chain from invention and design through planning and production clear to the ultimate user. In the case of products and equipment used for heating, ventilating, or air conditioning, engineering skill has to be applied to them from the time they are conceived until long after they are installed and operating.

The truth of this general statement, while probably self-evident, has not always been fully appreciated or evaluated either by engineers themselves or by those associated with them. One reason no doubt is that the degree of skill required varies so much at different parts of the economic chain. It also varies with different products. Moreover, under the established scheme of things, the responsibility for its exercise changes from step to step as the product passes through the hands of various legal owners on its way to its final resting place.

With some products and some marketing methods the degree of skill required is so slight that almost no one recognizes it as such. All these facts tend to mask the essential point that the "know-how" must be there.

On the other hand, where the degree of engineering skill is high the necessity for it has been gradually but eventually recognized.

Design and invention won earliest recognition. Then came production. More recently research and investigation have been conceded to require a high degree of skill, and this skill has gradually been provided. Marketing has not yet generally reached a position where many realize that it is essentially an engineering problem and can be greatly improved by engineers just as was done in the case of production. It is perfectly safe to predict that marketing is the next field to which engineering skill will be intensively directed, and that places where this skill can be used to advantage will appear where little suspected.

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More Low Cost Apartments

Another huge addition of four billion dollars has been requested to use in combatting the depression and for work relief. Just what is contemplated in detail is not yet known but it is reported that considerable sums are to be allocated to public buildings, to low cost housing of both the detached and multiple types, and for other purposes which will result in buildings being built. It is confidently expected that the sum will be forthcoming.

Laying aside all question of the wisdom of such spending there are other questions which are of interest to all of us. For instance, we wonder if this new sum will be so administered that there will be faster progress than resulted from the original PWA fund of two years ago. We wonder, too, if there is to be an arrangement which will let engineers receive a more liberal fee, and let contractors get work at a profitable figure.

In this issue we give a review of the present situation surrounding the construction of low cost apartment houses with PWA funds. Candor forces the admission that there is not much concrete activity in construction as a result. Instead the progress to date is really a record of how effectively private interests can block a public project by resort to the courts, and how difficult it is to move on an idea essentially new and not unanimously supported.

Reports also reach us that the fees allowed for design on these projects have been niggardly and that there was little object in bidding on much of the public building work let under the PWA funds.

On the positive side it does seem that intensive study has been given to suitable means of heating where first costs are rigidly restricted and where there is virtually nothing allowed in operating budgets for repairs and renewals. Interesting innovations in the plants are to be expected. In fact they are likely to set a new standard for heating plants in apartment buildings. Private builders will not be long in recognizing the good features of these new installations.

ABSTRACTS of Current Papers, Books and Pamphlets

Pipe Thawing with Arc Welding Machines

While pipe thawing is not a new application for arc welding machines, it came into real prominence during the cold winter of 1933-34. This method of thawing pipes proved extremely popular and profitable because it eliminates the necessity of digging in the frozen ground and often saves considerable time. Users also report that this method will not split the pipes.

Because of the interest shown in this special work of arc welding machines, a manual of pipe thawing has been published. The manual gives extremely valuable data on restoring frozen pipes to service. The first two pages cover general information such as methods of making connections and location of leads. Following this is a series of field reports of pipe thawing jobs. These reports go into great detail, show a sketch of the job, give length and size of cables in circuit, meter readings while thawing, time required, cost and price to customer, type of machine used, and various remarks concerning the job.

[*"Manual on Pipe Thawing," published by and obtainable from The Hobart Brothers Co., Troy, Ohio; 16 mimeographed pages.*]

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Air Conditioning for Hospitals

Evidence has long been accumulating in medical and hospital experience that air conditioning has therapeutic values. There seems little doubt that in summer heat many a patient—post-operative, pneumonia, cardiac—hovering between life and death, may be saved by just that added stimulation which results from dropping the room temperature a few degrees and removing some of the oppressive humidity. If the hospital, true to its traditions, is to provide for its patients all of the resources which science has found to be beneficial, it is obviously faced with the necessity of taking some steps to improve its air. However, the present cost of installing and maintaining air conditioning equipment is excessive and probably no hospital can afford a complete central system for its entire building. Medical investigation of controlled air therapy is hardly past its preliminary stages. When medical research has determined definitely its therapeutic values and the engineers shall have simplified their equipment and rationalized its cost, the hospital will be in better position to consider the wisdom of so large an investment as is involved in general air conditioning.

Types of Equipment: There are three general types of air conditioning equipment—the central system, the built-in-room unit, and the portable unit.

Central System: While complete air conditioning would appear inevitable in the hospital of the future, the duct type of central system which is now being installed in theaters, restaurants, and office buildings is a luxury which probably no hospital can afford. No hospital, so far as known, has ventured beyond a central system for its operating and delivery rooms, and even this limited installation has often proven a heavy financial burden, although most popular with the staff.

To give a general idea of the cost of a central duct system, as now designed, the experience of an office building erected in 1932 is cited. It is comparable in bulk to a 300-bed hospital, with an air conditioning plant then conceded to represent the most advanced ideas. The heating is entirely separate from the air conditioning. The building has 10 zone fan rooms, 17 motors for fans and pumps, with a total of over 100-hp. capacity, and a 300-ton refrigerator compressor with a 200-hp. motor. If it were a hospital this would mean a ton of refrigeration and more than a horsepower motor capacity for each bed. The cost figures applied to a hospital are illuminating. In the following tabulation it is assumed that the office building is in use 8 hr. a day, 5½ days a week, and the hospital 24 hr. a day, every day in the year, for which due allowance has been made in the engineer's computations.

Installation Cost	Office Bldg.	Hospital Without Air Conditioning	Hospital With Air Conditioning
Heating plant	$ 68,000	$68,000	$ 68,000
Air conditioning	165,000	.....	150,000
Exhaust ventilation ...	7,500	20,000	7,500
Total investment ...	$240,000	$88,000	$225,500
		An increase of....	137,500
Operating Cost, Omitting Labor			
Fuel and supplies, heating.....		$ 6,100	$15,000 $15,000
Power and maintenance, air cond..		17,000	 25,000
Power and maintenance ventilating		1,000	4,000 2,000
		$24,100	$19,000 $42,000
			An increase of.... 23,000

The average cost of 10 large hospitals completed in 1930 and 1931 was some $6,500 per bed. The annual expenditure for fuel, light, and power in 30 New York City hospitals in 1932 averaged $96 per bed. Applying these averages, the capital increase of $137,500 represents 7% or $455 per bed, and the $23,000 additional for operating, an increase of 80% in the average fuel, light and power expense. This may be accepted as a fairly accurate picture of what complete duct type central air conditioning as it is being installed today would cost a hospital.

Minimum Standards: The problem is to establish minimum standards in the light of present resources, to determine what features of air control will be of greatest value in the care of the sick and to find how and to what extent the hospital can afford to provide them.

The hospital should hesitate to haphazardly install some well-advertised piece of equipment in one or two rooms. Air conditioning is a problem to be considered in its entirety with an eye to the future. As an initial step a thorough survey of the mechanical plant should be made by a practical air-minded consulting engineer to the end that whatever is spent for air conditioning will make full use of the hospital's existing mechanical resources and conform to a general plan of mechanical modernization as outlined in the Report of the Committee on Planning and Equipment presented at this convention.

Humidity Control: The average hospital will materially improve its air in winter by the installation of humidifying equipment. For this, perhaps the most economical type will be a central spray unit connected with the domestic hot water supply, producing a fine vapor which is blown through copper ducts to one or more outlets in the corridors on each floor whence it penetrates as doors are opened into the room. An automatic humidistat starts and stops the fan and then controls the average relative humidity in the building. A compact 100-bed hospital would perhaps need two units costing approximately $2,200. The operating expense, heating 200 to 250 gal. of water a day and running two 1/3-hp. fan motors part time during the heating season, would not be excessive. Obviously, the results will not be as perfect as direct distribution in each room, but the moisture content will be substantially bettered at a cost within the hospital's means.

Built-in-Unit has all of the necessary machinery in a compact cabinet. It is usually placed at the window and requires water, waste, and electric connections. There is little uniformity in the rating and capacities of the various makes of built-in units. The cooling capacity varies from the equivalent of melting 1000 to 3000 lb. of ice a day, adequate for rooms with cubic contents of from 1800 to

4000 cu. ft. in a large private room, a two-bed ward, an operating or delivery room, or nursery. The total cost installed ranges from $700 to $1000; or if the heating element is omitted, from $400 to $700.

When units are used in several rooms, a central compressor will serve, the refrigerant being piped to each coil —an arrangement much to be desired because of a saving of from $200 to $300 per room, and, what is equally important, because the compressor, never any too quiet, can be located remote from the patients. The manufacturers' specifications present an almost infinite variety of styles and combinations from which the hospital can select the most appropriate to meet its individual needs.

As with all innovations, hospital air conditioning presents its own peculiar problems. The gravest danger is noise. The hum of a motor fan or compressor — almost inaudible in the sales room or in a business office—may seem to roar in the sick room, and it must be remembered that all machinery tends to grow more noisy with use.

This is a strong argument in favor of the multiple unit installation, with a central compressor placed far away from the patient, and then only the hum of the fan will reach his ear. Also to be considered is the possibility that sooner or later the cooling coils may give off a sour, rancid odor from the impurities in the air which are deposited on them. This is apt to happen when filters are not kept clean. When the recirculated air is sprayed, this difficulty is minimized. Again the unit will probably contribute its quota to hospital leaks, for while the cooling water is carried off in a closed waste line, the condensate is usually caught in a pan under the coil, which the maid or orderly must remember to empty.

Portable Room Cooler: When perfected, this type, from the standpoint of economy at least, will probably represent the most practical unit for meeting the comfort needs of hospital patients. It should be mounted on castors, and light enough so that it can be moved from room to room as readily as a portable x-ray or therapy lamp. There are a number of units now available—of two general types—those cooling by mechanical refrigeration and those using ice.

It must be stated in all fairness to the hospital that none of the units equipped with both condenser and fan seem sufficiently quiet, even when new, to be suitable for the sleeping room of the average patient.

The ultimate portable unit will probably be mechanical, but is apparently yet to be perfected. If one might venture to specify, the compressor will be primarily air cooled, by drawing slowly a large volume of air from, and returning it to the out-of-doors, through a partly opened window —it will be of the closed type, kept moist with water from a tank, the moisture adding perhaps 10° to 15° to the cooling effects of the outside air; thus combining condensation—evaporation and air travel. It must be quiet, mechanically simple, light and reasonably priced. This should not be too great a challenge to the engineering fraternity.

Ice Coolers: There are several coolers using water ice with tanks holding from 150 to 300 lb. which, it is claimed, will acceptably cool and dehumidify a good sized room for 8 to 10 hr. Obviously, the use of water ice will involve considerable noise, mess, and bother in trucking it to the patient's floor, filling the tanks, and drawing off the water into a pail or floor drain.

Solidified Carbon Dioxide: Or "Dry Ice" now in quantity production is available in most cities, and, given properly insulated containers, it can be shipped and stored with a loss of not over 3 to 5% in 24 hr. It is about one-third heavier than water ice and has nearly double the heat absorption—that is, 246 vs. 144 B.t.u.'s per lb. at 32°. It can be used with less waste but costs from $2.50 to $5.00 per 100 lb. Laboratory tests are pending to determine chemically how much the carbon dioxide content of the air in a room is altered by dry ice cooling. While any small increase of the CO_2 air content would not be hazardous, it might tend to increase the respiratory rate to such an extent that it would be comparable with the results of violent exercise.

Cost of Equipping a Hospital: The following approximate estimate is given of the cost of providing a reasonable minimum of air conditioning elements in an old building of 100-bed capacity, with equipment of appropriate type.

	Capital Cost	Annual Maintenance
Humidification—to treat 400,000 cu. ft. of building heated with steam or vapor; 2 spray units including fans and ducts	$2,200	....
Controls on Heating System—to reduce fuel consumption and avoid overheating, from	$500 to 1,500	....
Connections—to corridors from exhaust ventilating ducts, to improve air circulation	300	....
Five Built-in Air Conditioning Units—with Central Compressor—providing cooling, dehumidification, air washing; in two operating and one delivery room, one nursery, one deluxe private room at $500, installed	2,500	....
Six Portable Units—water or dry ice—at $150 each	900	....
Total	$6,400	....

It will, of course, be appreciated that because of many variables these figures can only be approximate. The location of the hospital, its type of construction, insulation against heat loss, climatic conditions—how much or how little equipment is needed, and how much of the time it must be operated—all will naturally affect the cost.

No attempt has been made to guess at the annual expense of operation as in this the imponderables are even more numerous. However, it may safely be stated that in many instances a hospital should be able to cover the annual expense of partial air conditioning, as outlined above, with little, if any, increase in its engineering budget, if it will study and control the use of fuel, reduce the waste from overheating, and from leaks in steam lines, valves, and traps. Money intelligently spent to insulate walls, roofs, and windows, will be amortized in a few heating seasons by the savings in fuel alone.

[*"Report of the Committee on Air Conditioning," American Hospital Association, 18 East Division St., Chicago. Bulletin 119; paper cover; 9 pages; 5¾ in. × 8¾ in.; price 50c.*]

Combustion in An Underfeed Burner

The latest report of the Bureau of Mines on the study of combustion of solid fuels should prove extremely valuable to engineers interested in the burning of fuels in stokers. The main subject of the report is a study of the combustion of solid fuels in an underfeed type fuel bed. The object was to determine the burning characteristics of various solid fuels, no effort being made to study the combustion above the fuel bed or the utilization of the heat developed by the burning.

Secondary objectives were to learn the effect of preheated air on combustion in both over and underfeed fuel beds and to study the distribution of ashes in the bed. As in the main part, investigations were limited to the fuel bed itself.

Most important point brought out was the essential difference between over and underfeed burning. In overfeed the only limit to the rate of burning is that the fuel shall not be blown out of the bed, and—except for the limitations imposed by loss of heat from the fuel bed by radiation—by increasing the depth of the bed the combustible gasified per pound of air can be made the maximum the air can carry. In underfeed, the maximum rate of burning for a given air supply is fixed by the rate of ignition and these two factors automatically fix the thickness of the fuel bed and the combustibles carried per pound of air. Since the rate of ignition did not increase indefinitely with increases in the air rate, but reached a maximum and then fell off, the rate of burning was likewise limited. Thus for a given fuel and air temperature, there was a maximum possible rate of burning that could not be exceeded.

Two methods of increasing the rate of ignition in an underfeed burner, and consequently the rate of burning, were found. The first method was to decrease the size of the fuel and the second was to increase the temperature of the primary air (preheating).

If the air supply was increased after the maximum rate of burning was passed, the rate of ignition tends to become zero and in some of the tests it was impossible to maintain burning at these high air rates. This is known as blowing out.

This blowing out is caused by two factors. First, since fuel is ignited by the heat radiated from the hot fuel above, when large amounts of air are supplied the fuel is cooled by the air passing over it. This tends to counteract the heating by radiation. At some unknown rate which varies with the fuel and its size, the counteracting effect increases more rapidly than the increase of radiation due to a higher rate of combustion. Second, the fuel bed gets thinner as the air rate increases and after some undefined thickness is attained the temperatures through the bed will decrease, and consequently the radiation will be less.

The above statements refer to unrestricted ignition. Ignition in commercial stokers may be restricted by controlling the rate at which the fresh fuel passes into the primary air stream. The maximum rate of burning per square foot possible in an underfeed stoker is determined by the rate of burning curve, which is different for each fuel. Above a certain primary air rate, the rate of burning is determined by the rate of ignition. For any given fuel and air temperature, no amount of manipulation can make the rate of burning exceed the value of this curve. When the maximum rate of burning is less than the rate of ignition, increasing the amount of fuel fed will result in an increasing thickness of the fire. When the rate of burning equals the rate of ignition, increasing this figure will result in the plane of ignition being gradually raised.

A considerable amount of space is devoted to a discussion of the application of the theoretical information obtained from this investigation to the operation of stokers. A report of the distribution of ashes in the fuel bed is also made. Altogether nine different types of coals and cokes were tested.

[*"Underfeed Combustion, Effect of Preheat, and Distribution of Ash in Fuel Beds," by P. Nicholls. Bulletin No. 378; Bureau of Mines. 6 in. × 9 in.; 76 pages; for sale by Superintendent of Documents, Washington, D. C.; price 10c.*]

Radiant Heat and Comfort

Comfort can be secured with cool air if a high temperature source of heat is available. Investigations have shown that the amount of radiant energy necessary to maintain comfort is determined by the difference between the temperature of the air and 65°. For example, with air at 60° a mean horizontal component of radiant energy of about 30 B.t.u. per sq. ft. per hr. produces warmth, while at 55° about 75 B.t.u. is necessary, at 50°—120, and at 45°—170. This investigation was carried out to determine the reaction of the human body to radiant heat of intensities from 7 to 10 times the above values.

In making the tests it was found to be important that all comparative tests be carried out on the same person, as human beings vary considerably in their ability to withstand exposure to radiant heat. In all cases it was found that much higher intensities of heat could be borne than are usually required for comfort in a room. The intensity of heat that could be endured varied considerably with the quality of the radiant energy. That is, the greater the amount of infra-red rays (short wave lengths approaching light) with a corresponding decrease of ultra-red rays (long wave lengths) in the source of energy, the more comfortable the exposure. This feeling of comfort and the ability to withstand exposure is in some way dependent on the skin penetrating ability of the energy. The infra-red rays are radiated deep into the skin while the ultra-red rays are absorbed mainly in the horny layer of the epidermis and travel by conduction through the living epidermis to the capillary blood streams.

Certain prior treatments to the skin which induce an accelerated flow of blood in the surface capillaries increase the ability to endure in comfort exposure to high intensities of radiant heat. For example, excitation of the capillary flow by gentle slapping of the skin enables a more prolonged exposure to be endured. On the other hand, it was found that a restriction of the blood flow induced by adrenalin injections leads to a decrease in the ability to withstand the effects of intense bombardment of the skin by radiant heat.

When the skin was exposed to intense radiations the pain increased until it became very acute. On continued exposure, the pain decreased until it was no longer noticeable. It was found that sweating of the skin and the consequent evaporation caused the reduction in the pain. Further investigations disclosed the fact that the ability to withstand intense radiant energy depended considerably on the amount of moisture on the skin.

[*"Radiant Heat and Comfort," by Harold Hartley. Journal of the Institution of Heating and Ventilating Engineers, London, September,* 1934. *Approximately* 5600 *words.*]

Study of School Building Heating Systems

This report presents operating cost data of heating systems in a number of Iowa schools. The purpose of the report, as stated by the author, is to make available in a convenient form, cost data which can be used as a basis of comparison by other schools. It also presents information which will prove helpful in the selection and installation of heating and ventilating equipment to give satisfactory operation and economical performance.

Information was secured from a total of 24 school buildings located in 13 cities and towns in Iowa. Data, which were secured for the seasons 1931-32 and 1932-33, covered the type of coal used, amount, where mined and cost, the electrical power used per season and cost per kilowatt, the time in months and wages paid to fireman and helper, and the total enrollment and average daily attendance of the school.

For convenience, the data collected are shown as a set of curves. In plotting the curves, the data were corrected or changed so that all data plotted were based on the same standard conditions.

[*"A Study of the Season Cost of Heating and Ventilating of a Group of Iowa Public School Buildings," by R. A. Norman, Professor of Mechanical Engineering, Iowa State College, Ames, Iowa. Mimeographed; paper-bound;* 8½ *in.* × 11 *in.;* 32 *pages.*]

Textbook on Heat

This book, an excellent text on heat, treats the subject from the viewpoint of the physicist. The aim of the author is to present a complete development of the subject and at the same time to avoid lengthy descriptions of classical experiments. Since complete references to the original papers are given, the book has gained considerably by this method of treatment.

Heating engineers interested in the theoretical study of heat will find much to hold their attention. The material is up to date and presents the latest findings and theories on this important subject. Some of the more important divisions of the book from the standpoint of heating engineers are those on specific heats, transfer of heat by conduction and convection, and studies of radiation. Other sections are on measurement of temperature, first law of thermo-dynamics, change of state, continuity of state, introduction to thermodynamics, production of low temperatures, and production of high temperatures.

[*"Heat," by James M. Cork. Published by John Wiley & Sons, Inc., New York; cloth bound; 6 in. x 9 in.; 279 pages; price,* $3.]

NEWS OF THE MONTH

Ventilating System for Highway Tunnel

SAN FRANCISCO—Work is progressing on a new motor traffic artery between Alameda and Contra Costa counties—the Broadway low-level tunnel project, leading from the intersection of Broadway and Keith Avenue in Oakland, up Temescal canyon and through the Berkeley Hills. It will replace the steep, narrow, and hazardous Tunnel Road.

The project will have two concrete-lined one-way tunnels, each 3168 ft. long, and broad approaches having four traffic lanes. The bores will be 15 ft. apart at the portals and 100 ft. apart in the middle. Each will have a 22-ft. roadway, with two traffic lanes, and a 3-ft. sidewalk.

The tunnels will be mechanically ventilated by an elaborate electrical system. Eight supply fans, installed in reinforced concrete buildings at the portals, will pump in 1,500,000 c.f.m. of fresh air, while eight exhaust fans will draw out a similar amount of polluted air. By this means carbon monoxide pollution will be kept down to two parts in 10,000. Recorders and detectors will indicate the degree of carbon monoxide at all times.

Chicago Cafeterias to Have A.C.

CHICAGO—The Ontra Cafeteria Co., Inc., has retained M. G. Harbula and Associates, consulting air conditioning engineers, to air condition its restaurants at 231 South Wabash Avenue and 123 North Wabash Avenue.

Major Harbula has just completed the designs and awarded the contract for the air conditioning of the new $40,000 home being built for A. C. Shepanek at Wilmette, Ill.

Texas Tech to Hold Welding Conference

LUBBOCK, TEX.—The School of Engineering of Texas Technological College here will hold its first annual welding conference on electric and oxy-acetylene welding February 14-15. All manufacturers and jobbers of welding equipment are invited to attend and display their welding equipment, and all those interested in welding are invited to attend. The course will include lectures and demonstrations on various phases of welding.

Those attending are requested to bring their welding glasses. There will be no charge for the conference and ample hotel accommodations can be obtained at reasonable rates.

Inquiries should be addressed to Prof. H. F. Godeke at the college.

Forms Manufacturing Concern

CAMDEN, N. J.—Charles Coward heads the newly incorporated Coward Engineering Company to manufacture heating and ventilation systems. The concern is capitalized at $100,000.

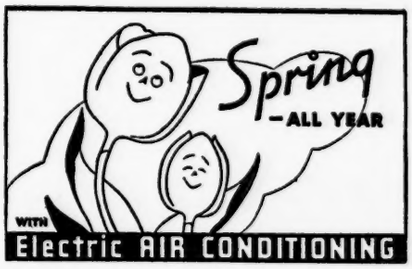
Birmingham Stores to Condition

The growing acceptance of air conditioning is demonstrated here, five major installations being planned for 1935. The Air Conditioning Bureau has letters from three department stores that installations will be made. They are Louis Pizitz Dry Goods Company, Odum Bowers & White and Loveman, Joseph & Loeb. The latter institution is building a new million dollar store to replace one burned.

The Burger-Phillips Dry Goods Company, which now has the only major installation in this city, will extend air cooling to its three upper floors. It now covers only the three lower floors.

The Birmingham Electric Company has signed a new lease on its six-story building and will install air conditioning before warm weather arrives again. This installation will be used not only for the comfort of employes but for sales demonstrations as well.

The S. H. Kress Company has taken a lease on a Birmingham corner on which it will erect a $500,000 building, air conditioned on all floors.



The local Air Conditioning Bureau is a non-profit, service organization for the purpose of disseminating information and suggestions with respect to air-conditioning. Inquiries invited. Telephone 3-3141, ask for Mr. Hugh Roberts, secretary-manager.

WEATHER AS YOU LIKE IT
AIR CONDITIONING
BUREAU
OF BIRMINGHAM

Part of a full-page newspaper advertisement of the Birmingham A.C. Bureau

Boston Utility Adds 1300 Gas Jobs

BOSTON—Six hundred million cubic feet of gas have been added to the annual load of the Boston Consolidated Gas Company as a result of adding 1300 gas house-heating customers to its books. Each equipment will average to use 460,000 cu. ft. yearly. The 1300 total is 700 more than the quota set by the company management for 1934, this quota having been reached six and a half months after the sales campaign started, and the final figure of 1300 being for a nine-month period.

The record week for sales of house-heating equipment was that of June 23, one of the hottest of the year, when 94 contracts were signed. One salesman closed 55 contracts in the period of 49 weeks, against his assigned quota of one per week.

N.Y.U. Engineers to Hold Dinner-Dance

NEW YORK—The New York University Heating & Ventilating Engineers Society, Evening Engineering Division, will hold its annual dinner-dance here Saturday, February 9, at 8 p.m., at the Tic Toc Club in the Park Central Hotel.

Officers of the society for this year are: President, T. J. Berk; vice-president, J. Dobak; treasurer, W. Dietz; secretary, G. Kaucher, Jr.

Denver Utility Conditions Basement

DENVER—An air conditioning plant which serves not only for comfort but as an exhibit to be witnessed by hundreds of persons every month has been installed in the auditorium of the Electrical Institute, in the basement of the Colorado Public Service company building here.

The auditorium, which contains also a model kitchen and living room, is donated for meetings held by various organizations.

The plant provides complete control of the air as to temperature, humidity, and movement. Part recirculated air is used.

Burner Men Join A.C. Group

BOSTON—Boston Oil Burner Associates have unanimously voted to become automatically associate members of the Air Conditioning Bureau of Boston, thus settling the question of a merger of the two organizations, which had been pending. Each thus keeps its separate identity.

Daniels Elected by A.C. Group

BOSTON—At the annual meeting of the Air Conditioning Bureau of Boston, January 16, which was attended by about 250 members and guests, the following officers were elected for 1935: President, Julius Daniels, assistant superintendent, Edison Electric Illuminating Company; vice-president, W. D. Wilkinson, New England Power Company; treasurer, Rudolph Sommers, vice-president, Boston Ice Company; secretary, Daniel Ricker, Edison company; directors, H. R. Sewall, vice-president, Cooling and Air Conditioning Corporation, and Don J. Edwards, president, General Heat & Appliance Company.

Guest speakers were R. J. Thompson of Wilmington, an officer of Kinetic Chemicals, Inc., who spoke of refrigerants, telling of the development of freon as a refrigerant and of its possibilities in the air conditioning field, and Walter L. Fleisher of New York, air conditioning engineer, who talked of the present position of the industry and of its future.

Heating Prices Low

WASHINGTON—The purchasing power of a 1926 dollar, if used for heating and plumbing materials, was $1.468 in October, 1934, according to the Bureau of Labor Statistics, U. S. Department of Labor. This figure compares with $1.339 as the purchasing power in October, 1933.

In October, 1934, a 1926 dollar would have bought $1.174 of all types of building materials, and $1.307 of all types of commodities.

Natural Gas Subject of Pittsburgh Group

PITTSBURGH, PA.—The regular monthly meeting of the Pittsburgh chapter, A.S.H.V.E., was held January 14. D. P. Hartson, operating manager of the Equitable Gas Company, spoke on the production and distribution of natural gas. His talk was illustrated with slides.

According to the speaker, nearly all the important natural gas fields in the United States are interconnected with 72,000 miles of pipe lines, but even so, natural gas accounts for only 5 to 8% of the national fuel market.

The following members were appointed to standing committees by President L. B. Pittock: Program: J. F. Collins, Jr., chairman; W. H. Osterlee; M. L. Carr; Membership: E. C. Smyers, H. B. Steggall, and L. S. Maehling; Attendance: R. J. J. Tennant, A. F. Giles, and R. B. Stanger.

Thirty-seven members and guests attended.

Utility Employes Study Agriculture

SAN FRANCISCO—The Pacific Gas and Electric Company has just put 26 of its employes through a short course at the California College of Agriculture at Davis to enable them to learn the latest ideas in scientific farming. The course covered: air conditioning, domestic use of electric heat, dehydrator air requirements, hop driers, orchard blowers for frost protection, effect of light on plant growth, mushroom cellars, pig brooders, soil sterilizers, brooder house ventilation, etc.

Kansas City Added 149 A. C. Jobs in '34

KANSAS CITY, MO.—There were 149 air conditioning installations made in this city in 1934 with a total tonnage of 1059¼, and with a connected load of 1029 hp., according to information received from Albert L. Maillard, air conditioning division, Kansas City Power & Light Company.

This brings the total number of installations in this city to 245, with a total tonnage of 2727¼, and a connected load of 2522 2/3.

A list of the types of building in which these installations are installed is shown in the accompanying table. There are, however, a few other installations in Kansas City which are not on the list, including the Municipal Auditorium, with a capacity of 1000 tons of refrigeration and a connected load of 2000 hp., and the Jackson County Court House, dedicated late in December, with a capacity of 2000 hp.

It is to be noted that the number of installations apply only to this City and do not include Kansas City, Kan.

	NUMBER	TONNAGE	HORSEPOWER
Bakeries	3	57	71
Beauty shops	3	12	12
Drugs	3	66	78
Hospitals	4	4¼	4½
Hotels	8	204	355
Mortuaries	5	28½	16
Offices	42	664¾	576
Restaurants	24	305½	379 1/6
Stores	18	163½	181½
Theatres	20	1005	1625
Private offices	22	32¼	35
Residences	94	184½	189½
TOTAL	245	2727¼	3522 2/3

Self Wins Prize

DENVER—Philip P. Self, Denver engineering teacher, recently was presented the Charles T. Main award of the A.S.M.E. for research in air conditioning conducted at the Colorado Agricultural college last year in preparation for his master's degree.

Two rooms were employed. In one normal atmospheric conditions were maintained, and in the other completely air conditioned atmosphere was provided. One hundred and fifteen students were used in the tests, which consisted of a series of weekly examinations, a careful record being made of the reactions of the students in each room.

The studies showed that air conditioning resulted in much greater accuracy by the students. The greater rapidity in answering on the part of the students in the normal room he attributed to nervous tension caused by poor air.

Form Heating Company

HARTFORD, CONN.—Mayflower Heating Corporation has been incorporated here with authorized capital of $50,000, of which $1,000 is paid in. Incorporators are G. T. Quistberg, E. Schiavone, and Nicholas B. Francis. Mr. Francis has been active in the merchandising of heating equipment and appliances for a number of years.

AOBA to Continue; Action on Joining NEMA Deferred

DETROIT—The board of directors, American Oil Burner Association, which held its regular quarterly meeting here January 8, heard a report from the special committee appointed by President Sherman to consider an affiliation with NEMA. The committee reported that the matter had been discussed, but because of unusual circumstances in connection with the respective codes of fair competition, it was felt to be an inopportune time to conclude the negotiations. It was therefore decided that nothing further would be done for the present and that the association would be continued as in the past.

The question of the oil burner show was discussed, and it was decided that the character of the show would be changed in such manner that it will be designed solely for consumer merchandising purposes. The details will be worked out by a joint committee of AOBA and NOBDA.

The annual meeting of the association will be held in Atlantic City in April, the sessions scheduled over a two-day period. Complete details as to time and place will be announced later.

Filene A.C. Plant Nears Completion

BOSTON—Part of the air conditioning installation of the William Filene's Sons Company store is now in operation, several of the units having been completed and placed in commission. The job will be completed about March 1. This installation, costing about $400,000, is the largest store equipment of its kind in New England.

Each of the eight floors in the main building above ground, and all floors in the four annex buildings, have individual automatic control except for the refrigeration, which is all done from a central plant in the sub-basement.

There are fresh air intakes on every floor, with copper louvers and screens. Wherever a louver location was required, windows were removed, or a hole cut in the wall. Eight thousand feet of sheet metal duct were used for which some 70,000 sq. ft. of metal was required. Eighteen million cubic feet of conditioned air is delivered through the store every hour.

Total area eventually to be conditioned is 318,000 sq. ft., not including the bargain basement, which has had an air conditioning system of its own since 1926. Fourteen thousand feet of straight line piping, 50,000 ft. of electric wiring, and three miles of conduits for the wires are also required, all this work being handled on direct contracts and work by the Filene Company, under supervision of its planning engineer, R. Brunel.

Refrigerating capacity of the combined new and former plant is 1200 tons, of which 750 tons is new.

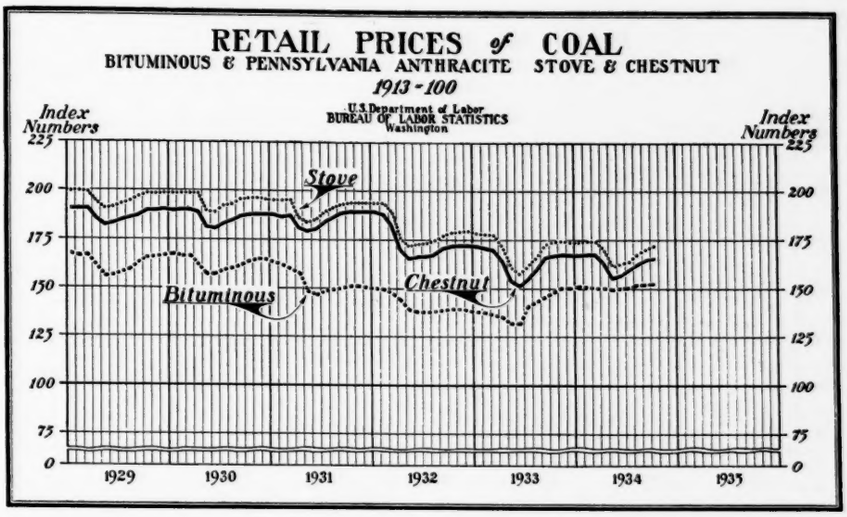
Gas Unit Heater for Denver Plants

DENVER—Gas-fired unit heaters have been installed in two large industrial plants here recently by the Public Service Company of Colorado. Eleven units were installed in the main production rooms of a one-story, saw-tooth factory building recently taken over and completely renovated by the Continental Can Company. Two of these were a special type, designed to prevent explosion of hazardous atmospheres, in this case fumes from lithographic ovens.

Ten units were installed in the plant of the American Brake Shoe & Foundry Company, replacing coke-fired salamanders.

New O. B. Law

FAIRFIELD, CONN.—Regulations governing the installation of oil burners have been incorporated in the Fairfield building code as an amendment, following complaints that faulty oil heating installation work was causing fires.



Boston Contractors Elect Officers

BOSTON—At the annual meeting of the Heating, Piping and Air Conditioning Contractors Association of Boston, the following officers were elected for 1935: president, Joseph F. Dwyer; vice-president, Louis McMurrer; treasurer, Maurice E. Chase; clerk, Walter H. Oleson. Directors: C. G. Bostwick, M. J. Flaherty, James P. Sullivan, L. H. Washburn.

Auditing Committee: W. G. Merrill, George Campbell, R. H. Baker.

Examining Board: Mr. Chase, Edward Brown, Frederick P. Williams.

Legislative Committee: Milton Fisher, Thomas O'Callaghan, Herbert A. Snow.

Nominating Committee: Mr. Merrill, P. A. Dolan, Arthur Klonower.

Law: W. H. Oleson.

Standards Committee: E. A. Dusossoit, L. R. Stetson, E. C. Whittaker.

Trades Relations Committee: Herbert A. Snow, Louis Hurley, C. G. Bostwick.

Welfare Committee: Harry E. Barber, Edgar Shaw, Louis McMurrer.

Following the business meeting T. J. Murphy, a member, entertained with songs, and was followed by "Pete" Blodgett of the First National Bank, Boston, who gave an informal talk, illustrated by motion pictures taken by himself, about an airplane trip he and a companion made to Alaska and Kadiak Island.

Snedden Promoted

SPOKANE—A. D. Snedden has been promoted to general superintendent of the Spokane Central Heating Company here, according to an announcement by J. E. E. Royer, vice-president and general manager. Mr. Snedden joined the company in 1918 as chief engineer, and in 1931 was placed in charge of operation of the heating company. Prior to joining the heating organization, he was with the Armstrong Ice Machine Company.

Anthracite Price Trends

WASHINGTON—The average retail price for Pennsylvania stove anthracite in October, 1934, was $13.32 per ton of 2000 lb., or 172.4% of the 1913 average price. Chestnut coal sold for $13.11, or 165.7% of the 1913 average price. Bituminous coal used for domestic heating sold at an average price throughout the country of $8.35, or 153.6% of the 1913 average.

These figures are reported by the Bureau of Labor Statistics, U. S. Department of Labor, in its study of wholesale and retail prices. The accompanying chart shows the trends of these fuels graphically.

Downes Heads Local A. C. Organization

KANSAS CITY, MO.—The Air Conditioning Council of Kansas City elected officers at its recent annual meeting. Chairman of the group will be Nate W. Downes, chief engineer of the Kansas City School Board. Other officers are: W. L. Cassell, consulting engineer, vice-chairman; G. W. Weston, secretary and manager, Electric & Radio Association, vice-chairman; Walter Gillham, consulting engineer, vice-chairman; G. E. Olson, treasurer; Albert L. Maillard, Kansas City Light & Power Company, executive secretary.

The following organizations which underwrite expenses of the Council are: Air Conditioning Corp. (General Electric); Frigidaire Corp.; Gustin Bacon Mfg. Co. (Carrier); Kansas City Gas Co.; Kansas City Ice Co.; Kansas City Power & Light Co.; Moser & Suor, Inc. (Norge); Natkin & Co. (Westinghouse); Olchoff Engineering Co. (Frick); Townley Metal & Hardware Co. (Servel).

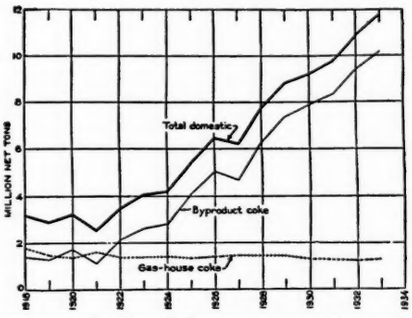
The underwriting members cooperate in publishing a four-page promotional newspaper called the *Air Conditioner*, which is mailed each month to a selected list of 3000 prospects.

Coke Consumption for Heating Increasing

WASHINGTON—There were 10,215,360 tons of byproduct coke sold for domestic use in this country in 1933, according to the Bureau of Mines, U. S. Department of the Interior. This figure compares with 9,422,343 tons in 1932, so that the increase from 1932 to 1933 was 7.9%. In the last 10 years, according to the Bureau, which has recently published its annual report "Coke and By-Products," use of domestic coke has increased 263%.

The states using the largest quantities of coke for domestic purposes were New York and Michigan, each of which used somewhat over 1,830,000 tons during 1933.

The value of the total quantity of byproduct coke used for heating purposes in the U. S. during 1933 was $52,280,220.



Trend of Coke Sales for domestic heating purposes

The accompanying table taken from the report shows the consumption of solid fuels for several years for domestic purposes.

TONS OF SOLID FUEL USED FOR DOMESTIC HEATING

	1924	1932	1933
Domestic anthracite†	66,086,804	35,832,275	35,518,000
Briquets	580,508	550,892	572,825
Byproduct coke*	2,812,771	9,422,343	10,215,360
Bituminous*	‡	‡	‡

†*Including buckwheat No. 1.*
**For domestic use.*
‡*Between 56,000,000 and 77,000,000 tons a year.*

Furnace League to Advertise A. C.

CLEVELAND—Belief in the future of air conditioning will lead to an extensive advertising campaign by the Warm Air Furnace & Air Conditioning League, it was announced January 25. The league was formed January 24 at the Cleveland Electric Illuminating Company, where some 200 metal and furnace men met to form themselves into a cooperative trade association.

At this meeting also were begun classes in air conditioning which these dealers will continue to attend under Eugene P. Faris, research engineer of the Emerson Electric Manufacturing Co., St. Louis. Classes will be held each Thursday night, confined to members of the league. "Air conditioning will pull us out of the depression," Mr. Faris told the group. "Potentially, it is a far greater industry than radio or electric refrigeration. Air conditioning will lead in the renovation of homes Obviously, it is a great health factor."

Trade School Holds A.C. Forums

ST. LOUIS—Open forums on air conditioning, to which the general public is invited, were begun January 14 by the David Ranken, Jr., School of Mechanical Trades. The forums are held each successive Monday evening for seven weeks, and are under the direction of George B. Rodenhiser, head of the school's heating and air conditioning division.

Wine Cellar Kept at 55°

SAN FRANCISCO—The City of Paris wine cellar is perhaps the most ambitious project of its kind in any department store in America. It is kept at a constant temperature of 55° by means of an air conditioning system.

One of the interesting features of the cellar is the section built with a vaulted ceiling in which is stored a large stock of case goods. One reason for the vaulted ceiling is that some wines are said to keep better under a round ceiling than under a straight roof. Another interesting section is the department devoted to carrying bottle goods, in which special metal frames are used to carry the bottles at just the right angle.

Home Study Course Cost Up

NEW BRUNSWICK, N. J.—Rutgers University extension division will increase the cost of its home study course in air conditioning, now available at $18. The price after February 15 will be $24. Enrollments mailed on the 15th will be accepted at the old rate.

Heating Plant for Washington State College

SEATTLE—On the extensive new heating plant for Washington State College at Pullman, C. C. Moore & Company of this city were declared low bidders, at $118,128. The building complete is costing $280,000.

Birmingham to Have A. C. Show

BIRMINGHAM—An air conditioning show is now being discussed in Birmingham to be held in the early spring, further intensifying the interest now being shown in the subject. If the show is held leading dealers will have exhibits with the Birmingham Electric Company taking the lead.

Two new dealers have recently been appointed in Birmingham, James Arthur Smith representing General Electric Products and Bromberg & Company representing Airtemp, Inc. At least one other dealer will likely be appointed soon.

Besides the number of installations contemplated by business houses and factories, an installation is now being made in a new home in process of construction.

N. Y. Chapter Hears Talks on Corrosion

NEW YORK—The subject of corrosion was ably treated by three speakers at the regular monthly meeting of the New York Chapter, A.S.H.V.E., held January 21 in the Building Trades Club.

The first speaker, W. H. Finkelday, consulting metallurgist and chemical engineer, Singmaster & Breyer, discussed the general subject of corrosion of metals and showed the large annual loss caused by corrosion.

Cecil M. Stern, consulting engineer, Metropolitan Refining Company, gave the results of a number of tests on the use of various chemicals for preventing corrosion of air conditioning apparatus. He dealt specifically with the treatment of the spray water, showing how untreated water can very quickly become extremely corrosive. In concluding he stated that a competent corrosion engineer should be called in whenever trouble is encountered.

Victor B. Gershon, research engineer, Aquatic Chemical & Metallurgical Engineers, illustrated his talk on "Scientific and Practical Aspects of Corrosion and Scale in Boiler Plants and Other Water Systems" with a number of experiments which demonstrated the method of treating boiler waters. He described temporary and permanent hardness, showed the difference between them and the various methods of treating them. He demonstrated how a colloid, such as gum arabic, can be used to increase the surface tension of the boiler water so that the substance precipitated by the water treatment does not settle in the boiler or water feed lines. Cause and treatment of boiler scale, caustic embrittlement and metallic corrosion were also discussed by Mr. Gershon.

About 100 members and their guests were present.

Oil Prices Advance

NEWARK—A 7% rise in prices of fuel oil for domestic heating became effective January 5, with all members of the Fuel Oil Association of New Jersey, organization of oil retailers, cooperating. The price of the No. 2 and No. 3 oil advanced from 7 to 7½ cents a gallon. No. 1 oil remains the same, 8½ cents a gallon. No. 4 oil, formerly 6½ cents, is now 7 cents.

NEW YORK—Effective January 9, the terminal and tank car price of Esso Heat Light (No. 1 heating oil) was increased from 6 cents per gal. to 6¼ cents at New York, Baltimore, Norfolk, and Charleston Harbors. Barge deliveries at New York Harbor are ¼ cent less.

Mart Addresses Kansas City A. S. H. V. E.

KANSAS CITY, MO.—Leon Mart, president of the Marley Company, gave an interesting illustrated lecture on water cooling devices before the regu'ar monthly meeting of the Kansas City Chapter of the American Society of Heating and Ventilating Engineers, January 14. Thirty-five members and nine guests attended.

The president, L. A. Stephenson, appointed a committee consisting of G. L. Bliss, treasurer, and L. R. Chase, secretary, to get out a roster of the membership before the February meeting.

David Caleb announced that the Johns-Manville Company will show a sound picture on "Sound" in Edison Hall, February 8, and invited members of the chapter to attend.

Secretary Chase read an invitation from the Kansas City Section of A.S.M.E. to attend a moving picture sponsored by Babcock & Wilcox to be shown February 25 at the President Hotel.

Small Heads Underwriters' Laboratories

CHICAGO—At a special meeting of the board of directors of Underwriters' Laboratories, held here January 7, vice-president A. R. Small was unanimously elected president, succeeding the late Dana Pierce.

Mr. Small, a graduate of the University of Maine, joined the staff of Underwriters' Laboratories in 1906 as assistant engineer in the electrical department. In 1908 he was made special agent, and in 1910 was appointed superintendent of label service department, which he had organized. He continued in charge of the label service after election as vice-president in 1916 until his transfer to New York in 1924 as resident vice-president.

Railroads Conditioning Cars Rapidly

NEW YORK—Between $4 million and $5 million of orders for railway air conditioning are being filled or are pending, with the total number of conditioned cars now in service at about 3,000.

There were 932 mechanical, 749 ice, and 197 steam ejector car installations made during 1934.

SAN FRANCISCO—During 1935 the Santa Fé Railway will completely air condition all its principal trains and make similar improvements to other passenger equipment as rapidly as possible. The air conditioning program for the year will involve an expenditure approaching $1,800,000. This will give the company a fleet of about 300 air conditioned cars of various types, or almost enough to insure complete air cooled service throughout the 12 states it serves.

During 1934, the Santa Fé spent more than $800,000 in air conditioning its dining cars, numerous club, lounge, observation, cafe, and standard sleeping cars. The 1935 program includes more than 200 additional standard and tourist sleepers, chair cars, parlor, cafe, club, and lounge cars.

DENVER—Sixteen coaches and four new combination observation and dining cars will be air conditioned by the Denver and Rio Grande Western railroad at its shops here. Ice water is pumped into the cooling pipes from a tank under the car, which carries 3600 lb. of ice. The cars will be operated between Denver and Salt Lake City on the scenic Royal Gorge and the new Dotsero cut-off routes.

SEATTLE—Both the Great Northern and the Northern Pacific railroads, endeavoring to capture the early-spring travel crowds and the influx of summer tourists to this territory, are banking on air conditioning as a modern feature of railroad success.

As the Northern Pacific announced that it would inaugurate the spending of a $2,350,000 financial program on air conditioning and streamlining of its North Coast Limited fleet, the Great Northern's Empire Builder left Seattle with the first of its sleeping cars air conditioned.

The two air conditioned Pullmans, one christened the A. A. Denny in honor of the first pioneer to Seattle, leaving Seattle a cold mid-January evening, were the first to enter into transcontinental passenger service in the Northwest—en route for Chicago, and the East.

Colby Describes Holyoke Job

BOSTON—About 100 members and guests attended the January meeting of the Boston chapter, A.S.H.V.E., January 14 at the Engineers' Club. C. W. Colby, consulting engineer, who had charge of installing the battery of oil burner-boilers at Mount Holyoke College, was the speaker, and gave a detailed description of that plant.

Burner Dealers to Hold National Convention in April

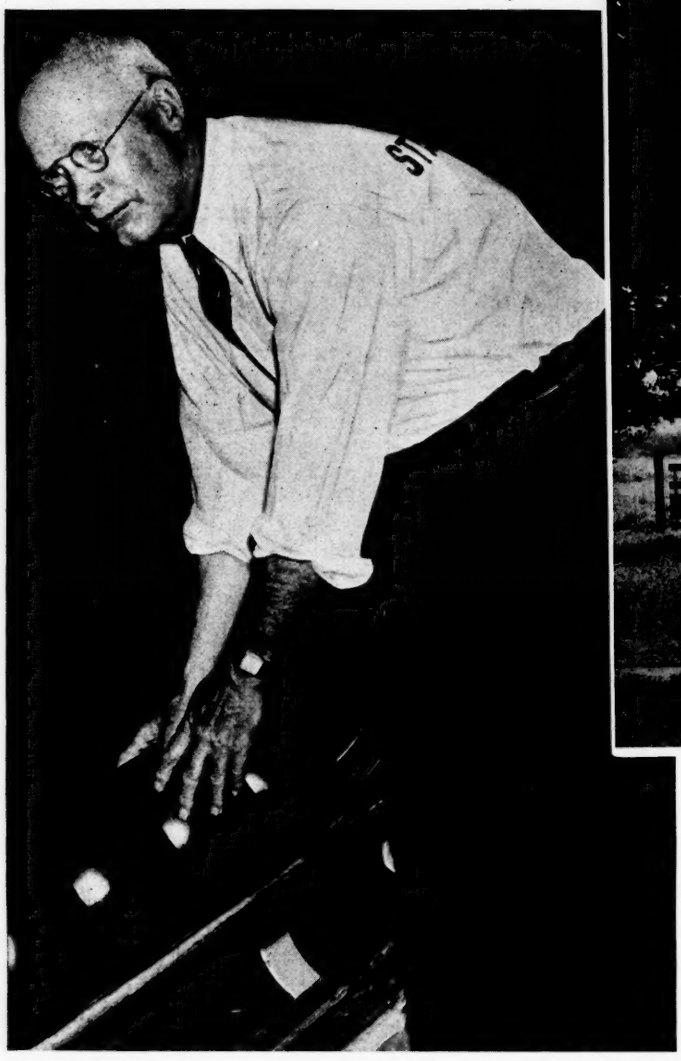
NEW YORK—At a meeting of the board of directors of the National Oil Burner Dealers Association, held here January 14, it was decided that the Association will hold a two-day convention at the Pennsylvania Hotel April 2-3.

This action was taken in compliance with an understanding with the American Oil Burner Association in which the latter voted to have its annual meeting in Atlantic City during April. It was decided by the directors of AOBA not to have its annual oil burner show this year in connection with the meeting and to dispense with the sales and engineering sessions that were customarily held in connection with annual meetings.

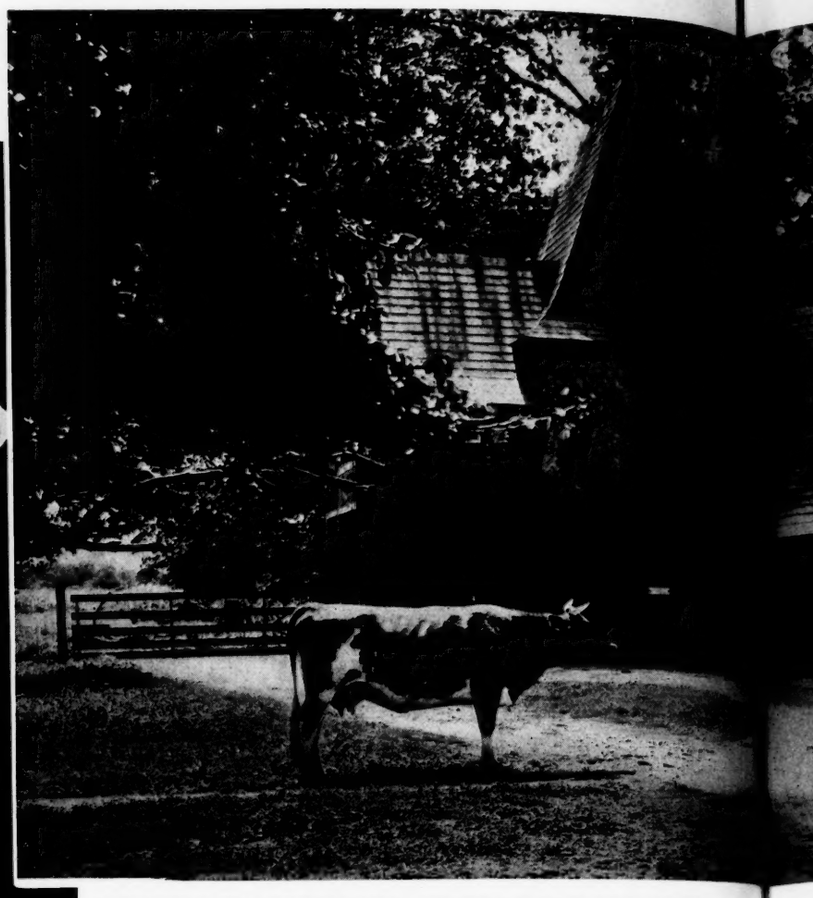
The two-day convention of NOBDA will attract manufacturers, distributors, dealers, and salesmen selling oil-burning equipment from all over the country, and the meeting is certain to attract a large attendance from the Atlantic Seaboard, where 65% of the volume of oil-burning equipment is sold and where at the present time NOBDA draws its largest membership.

The first day of the convention will be devoted to the annual meetings for election of officers, meetings of the old and new board of directors, and a meeting of the new executive committee. The second day will be devoted to two merchandising sessions, one in the morning and one in the afternoon.

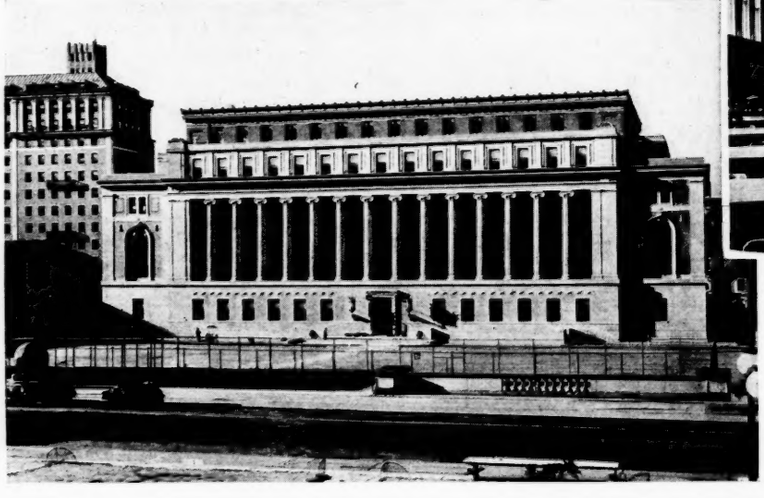
Directors of AOBA at their meeting January 8 voted to cooperate with NOBDA in obtaining members for the latter, based upon a new dues schedule of 50 cents per unit, collectable by the manufacturer and payable to the association on the 10th of each month for all monies collected during the previous month. NOBDA has issued a 12-page booklet entitled, "Why Oil Burner Dealers Should be Members of the National Oil Burner Dealers Association," and it is the intention of the association to furnish each manufacturer with a sufficient supply of these booklets to enable them to cooperate with the association in the membership drive. Under this new schedule, dues of all members heretofore paying $2 per burner will be automatically reduced on February 1 to 50 cents per unit, whether of the conversion type oil burner or oil-burning boiler-burner unit.



PERFECT SCORE. C. W. FEDDERS, VICE-PRESIDENT OF FEDDERS MFG. CO., BUFFALO, BOWLED A PERFECT SCORE OF 300 OCTOBER 23 WHILE BOWLING IN THE MASONIC LEAGUE. ACCORDING TO A SPORTS WRITER IN THAT CITY "NOT A SINGLE ONE OF THE HITS COULD BE CLASSED AS LUCKY." IT WAS THE FIRST PERFECT SCORE IN THE LEAGUE'S HISTORY, DURING WHICH TIME OVER 150,000 GAMES HAVE BEEN ROLLED. MR. FEDDERS HAS BEEN BOWLING FOR 25 YEARS.



VENTILATED COWBARNS, GREEN LANE FARMS, ELIZABETH, N. J. VENTILATION IS INTRODUCED THROUGH THE "CHIMNEYS" ON TOP OF THE ROOF AND LED THROUGH DUCTS INTO THE BUTTRESSES FROM WHICH AIR IS INTRODUCED TO THE STALLS NEAR THE FLOOR LINE. THE DUCTWORK IN THE ROOF IS HIDDEN BY A FALSE CEILING.



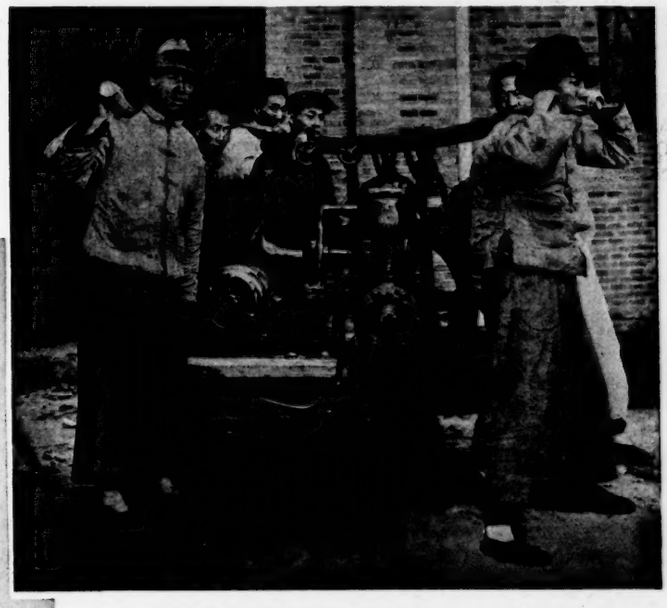
Wurts Bros.

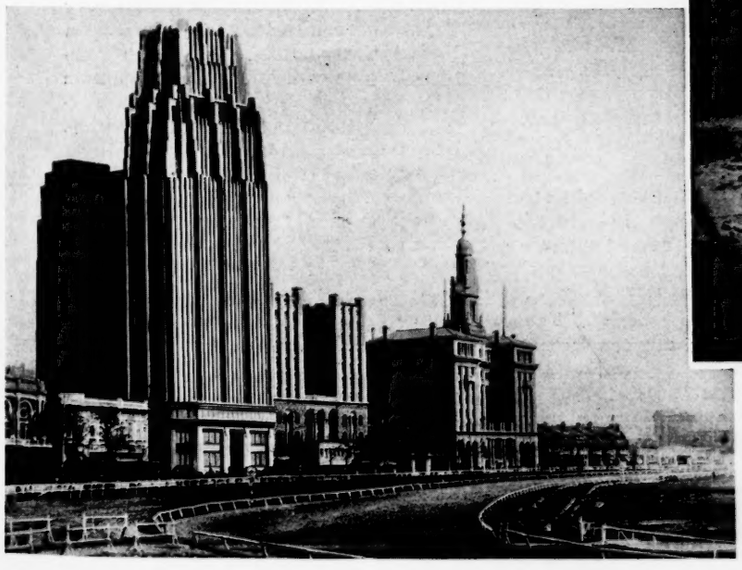
AIR CONDITIONED LIBRARY. THE $4 MILLION SOUTH HALL, COLUMBIA UNIVERSITY'S NEW LIBRARY. ALL THE ROOMS ARE AIR CONDITIONED. IN THE MAIN READING ROOM (ABOVE) THE GRILLES CAN BE SEEN IN THE FRIEZE. LIGHTS ARE INSERTED IN THE CEILING TO THROW BEAMS DIRECTLY ON EACH TABLE. MEYER, STRONG & JONES WERE THE ENGINEERS.

Wurts Bros.

80-FT. THERMOMETER ON THE OUTSIDE OF A DENVER FUEL COMPANY OFFICE. THE HUGE INSTRUMENT WEIGHS OVER ONE TON AND ALL LETTERS AND NUMERALS AS WELL AS THE SCALE ARE CONSTRUCTED OF NEON TUBING, VISIBLE FROM A GREAT DISTANCE.

PICTURE PARAGRAPHS





AIR CONDITIONING IN CHINA. AT THE LEFT IS THE NEW 22-STORY STEEL AND CONCRETE HOME OF THE JOINT SAVINGS SOCIETY IN SHANGHAI, WITH AIR CONDITIONING IN THE LOBBY, LOUNGE, DINING ROOM, GRILLE ROOM, AND BANKING HALL. THE VIEW ABOVE SHOWS NATIVES TRANSPORTING SOME OF THE REFRIGERATING MACHINERY. AIR CONDITIONING AND REFRIGERATION BY YORK.

WITH THE MANUFACTURERS • • • •

Max D. Rose

AMERICAN RADIATOR CO., New York, has elected Max D. Rose, eastern sales manager, a vice-president of that company. Mr. Rose, who was appointed eastern sales manager a year ago, entered the employ of the company in 1906 immediately after his graduation from the University of Chicago.

He became assistant to the manager of the Chicago branch in 1910, after four years as salesman. Three years later he was made manager of the Denver branch of the company, a position he held until 1918 when he was appointed assistant general manager of sales.

AMERICAN DISTRICT STEAM CO., N. Tonawanda, N. Y., has appointed R. E. Martin, 1027 Hunt Building, Tulsa, Okla., exclusive sales agent for that company in Oklahoma.

BASTIAN-MORLEY CO., LaPorte, Ind., has appointed Stanley Jenks as manager of its Eastern Division. Mr. Jenks was formerly with the Northern Indiana Public Service Company at Hammond, Ind., where he was in charge of residential and rural sales for that utility.

BELL & GOSSETT CO., 3000 Wallace St., Chicago, has appointed R. E. Moore vice-president in charge of sales.

The company has appointed J. A. Ivester, 82 Bristol Road, Medford, Mass., a direct factory representative in the New England territory.

BINKS MANUFACTURING CO., Chicago, announces that Leonard W. Horr, formerly Chicago manager for the Henry Vogt Machine Company, has accepted a position with the Binks Cooling Equipment Division.

THE BLACK SERVANT COAL STOKER CO., 2951 North Market St., St. Louis, has been organized to take over the business of the Black Servant Manufacturing Company in the manufacture of coal stokers. R. Y. Henry is president of the company.

COMBUSTION ENGINEERING CO., INC., New York, announces that Carl Stripe has joined its sales organization. Mr. Stripe was for the past two years assistant to the vice-president of The Davis Coal and Coke Company. In his new position he will be in charge of industrial stoker sales under the direction of H. S. Colby, general sales manager, and will give particular attention to a unit which has been developed to afford small industrial and heating plants many of the mechanical and economic advantages possessed by larger stoker installations.

DAVIES AIR FILTER CORP., New York, has appointed Preferred Utilities Co., Inc., New York, as its exclusive distributor for Airplex air filters in New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, and Washington, D. C. G. W. Bohn has complete charge of sales and engineering.

FRIGIDAIRE CORPORATION has appointed the Automotive Equipment Company of Omaha as distributor for Nebraska and seven counties in southwestern Iowa. The company, owned by M. L. Livingston, will wholesale Frigidaire air conditioning units and refrigeration equipment.

GENERAL REFRACTORIES CO., Philadelphia, has appointed Patton Clay Manufacturing Co., Syracuse, N. Y., as dealer-agent in the Syracuse area. Patton Clay will carry a complete stock of refractories in addition to its line of building materials.

George F. Motter's Sons Supp'y Co., York, Pa., has been appointed dealer-agent in the York area, and will carry a complete stock of refractories.

GORTON HEATING CORP., Cranford, N. J., has appointed William H. Heagerty, sales engineer with offices in the Chandler Building, Washington, D. C., as its sales representative for the District of Columbia and most of Virginia.

KELVINATOR CORP., Detroit, will open a factory sales branch in Chicago. G. E. Rogo has been named manager of the outlet, scheduled to begin operations December 1 at 830 Rush Street. In Chicago proper the branch will confine its activities to air conditioning and apartment house work, with household refrigeration and the corporation's other products being handled by Commonwealth Edison Company. Outside Chicago the branch will distribute all Kelvinator lines.

Mr. Rogo was for 10 years assistant treasurer of Kelvinator and three years district manager for Leonard Refrigerator Company. He joined Kelvinator in July, 1921, when all operations were confined to a small plant on Fort St., Detroit, and when Kelvinator's total daily output was fewer than 20 units.

L. J. MUELLER FURNACE CO., Milwaukee, Wis., has promoted C. L. Hewitt, Jr., to be eastern sales manager with headquarters in Baltimore. Mr. Hewitt has been connected with the company for the last 14 years, the last seven years of which he has acted as Baltimore branch manager. In his new capacity he has charge of all eastern territory from Main to Florida.

L. J. MUELLER FURNACE CO., Milwaukee, Wis., has appointed N. M. Blanchard as western sales manager with headquarters in Omaha. Mr. Blanchard has been connected with the company for 11 years, the last three of which he was the Omaha branch manager. In his new capacity he has charge of the northern tier of states between Minneapolis and Salt Lake City.

JAS. P. MARSH CORP., Chicago, has appointed J. J. Landers, 303 Crosby Building, as its sales representative in that territory.

NATIONAL RADIATOR CORPORATION has opened a new sales office and warehouse for the metropolitan New York area at 30-20 Thompson Ave., Long Island City, New York. Fred R. Dannies is the manager and R. A. Schmicker the assistant manager.

OSTER-WILLIAMS, Cleveland, manufacturer of pipe and bolt threading equipment, has opened an office and display room at 292 Lafayette St., New York. It will be in charge of the district manager, H. B. Van Osten.

H. A. THRUSH & CO., Peru, Ind., has transferred T. O. Lanphier, former New York manager, to the factory sales staff for special sales promotion work. C. W. Norby, recently New Haven branch manager of American Radiator, has joined the Thrush Company to take charge of the metropolitan New York area. E. D. Noland, formerly Philadelphia factory representative, has been transferred to the direct branch office in Boston, in charge of the New England territory. J. S. Blackmore has been transferred from Chicago to Philadelphia as factory representative in charge of that territory.

WESTINGHOUSE ELECTRIC & MFG. COMPANY has appointed as sales manager of the air conditioning department S. F. Myers, who participated in the formation of the department two years ago, and has been active in sales and promotional operations since that time. Mr. Myers, who will make his headquarters in the East Pittsburgh Works of the company, has been with Westinghouse since 1915.

Knudsen Wins Science Prize in Study of Sound Absorption in Gases; Results Important to Air Conditioning Engineers

PITTSBURGH—Absorption of sound at high frequencies in a room is more affected by the humidity and temperature of the air than it is by the absorbing boundaries of the room, according to Prof. Vern O. Knudsen, of the University of California at Los Angeles, who was awarded the $1000 prize awarded annually by the American Association for the Advancement of Science. Professor Knudsen's prize-winning paper, presented at the annual meeting of the association here recently, reported his researches on the absorption of sound in gases.

The paper described what is regarded as "epoch-making invesigations" in the fundamental principles of propagation of sound, both in air and gases, which are expected to be of vast practical importance in the development of better acoustics. In addition, the researches have opened up a new field in the study of the energy states of molecules.

Professor Knudsen has devised new methods for the study of the absorption, or dampening, of sound by air, gases, water and mixtures of these in various proportions, and as a result has learned new fundamental principles which establish the laws governing such absorption. These new principles shed an entirely new light on the production of sound and on what the molecules of the various mediums do to the sounds of different frequencies.

It has been found, for example, that above a frequency of 4,000 cycles per second the attenuation due to the absorption of sound in oxygen is so rapid that it decreases to one-millionth of its intensity in traveling a distance of 60 meters, or 64 yards.

This means that if we lived in an atmosphere of oxygen the consonants of high frequency in speech sounds could scarcely be heard across an ordinary street.

Other practical results already obtained from Doctor Knudsen's work were listed to be the following:

The "acoustic transparency" of the air, that is, the sound-carrying medium's efficiency of propagation, can now be calculated at any temperature and humidity. This is expected to be of great practical importance in the air conditioning of musical auditoriums, opera houses, and theaters, as it can be determined for the first time just what conditions of humidity and temperature will produce the best results in carrying the sounds with a maximum of efficiency from the stage to the audience.

In pure science Doctor Knudsen's investigations furnish a new technique for investigating not only the nature of the collisions of molecules, but also the nature of the molecular forces involved. For the first time sound waves have been harnessed to explore the mysteries of the molecule's behavior.

The theories of classical physics on the absorption of sound in gases, Doctor Knudsen states in his paper, included the effects of viscosity and heat conductivity, but neglected the effects of the transfer of energy during the collisions of molecules. This neglect resulted in discrepancies between theory and observed fact.

The theoretical part of the present investigations, Doctor Knudsen states, was modeled after a treatise by Einstein on the propagation of sound in partially dissociated gases.

The classical theory was based on the belief that sound waves traveled longitudinally, in straight lines, with a translational motion, swinging back and forth like a pendulum. Doctor Knudsen has found that in addition to this pendulum-like motion the sound-waves also have an additional rotary, or spinning motion, imparted to them by the spinning molecules of the medium in which they travel.

As the longitudinal, straight line back-and-forth motion of sound waves is a well known quantity, Doctor Knudsen's method has devised experimental means for determining the rotational motion of the molecules through which the sound-waves are propagated.

He sends sound waves of a known frequency through various gas mediums at known temperatures and frequencies. He first determines the original energies of the sound waves, and then measures their energies after they have passed through the medium under investigation.

According to classical theory, in which only the longitudinal motion is considered, the energy loss after passing through a given medium should be a certain definite amount. The actual loss, however, has been found to be greater than the classical theory called for. The increase in the loss, Doctor Knudsen has determined, is due to the rotational, or spinning, energy of the molecules in the sound-medium. From previously unaccounted-for energy loss Doctor Knudsen has evolved mathematical formulas which determine the energies involved in molecular collisions.

In his studies of gases used as sound-mediums Doctor Knudsen has found that oxygen absorbs about five times as much sound as air. Oxygen is the most sound-dampening gas he has found so far. This knowledge is expected to prove of great importance in the reduction of noises, regarded as the cause of considerable economic loss.

Another discovery of Doctor Knudsen is that temperature and humidity, namely, the amount of moisture in the air, play an important role in the transmission of particular notes or frequencies in an auditorium. Hitherto acoustical engineers failed to take these factors into account.

"It is found," Doctor Knudsen reports, "that the effect of adding wave-vapor to oxygen is to produce first a large increase in absorption, followed by a decrease.

"It has been found also that there is not a linear relation between the frequency at which the absorption is a maximum and the concentration.

"Through our data it is now possible to obtain a rather extensive and reliable curve relationship between frequency and the concentration of water-vapor at which the absorption is a maximum."

Allow Coal Cost on Burner Purchase

BOSTON—Gilbert & Barker factory branches are offering to remove coal from the cellar of a Gilbarco burner purchaser, and allow him full credit for it, counting this as a down payment on the equipment. No other payment is required for a month and a half.

Welding Conference Scheduled

COLUMBUS—The fourth annual welding conference, conducted by the department of industrial engineering, Ohio State University, will be held February 28 and March 1 in the Industrial Engineering Building here. An interesting program, consisting of papers, demonstrations and exhibits, has been prepared.

Half Million Asked for New Plant

STORRS, CONN.—President Charles C. McCracken of Connecticut State College here has announced that he will ask the state legislature, now in session, to appropriate $723,000 for five building projects at the college. Of this amount, $435,000 is required for a new central heating plant for the college buildings.

Mayo President of O.B. Associates

BOSTON—Harry J. Mayo of Lawton Engineering Company was elected president of the Boston Oil Burner Associates at the annual meeting January 8. Clarence H. Fay was elected vice-president and Fred M. Beckwith, consulting engineer, was re-elected secretary-treasurer. Don J. Edwards, the retiring president, and J. J. Kelly were elected directors to serve with the three officers.

Refrigeration Standards Approved by A.S.R.E.

NEW YORK—Standard definitions and ratings for commercial refrigerating equipment were presented by a joint committee in its first formal report before the 30th annual meeting of the American Society of Refrigerating Engineers here in December. The committee is composed of three representatives of the Refrigerating Machinery Association, the refrigeration division of the National Electrical Manufacturers' Association, and the American Society of Refrigerating Engineers. Glenn Muffly is chairman.

The standards, which were accepted by the council of the A.S.R.E. as standard, providing the other participating organizations approve, follow:

Proposed Method of Rating Condensing Units

1. *A mechanical condensing unit* is a specific refrigerating machine combination for a given refrigerant consisting of a motor driven compressor for operation at a given speed, a condenser, a liquid receiver and the regularly furnished accessories.

2. *The power input rating* of an electrically driven mechanical condensing unit is its total power input in watts when the unit is operated under the conditions specified in Par. 4.

3. *The capacity* of a mechanical condensing unit is the refrigerating effect in B.t.u./hr. produced by the change in total heat between the liquid refrigerant leaving the condensing unit per hour and the total heat of the vapor refrigerant entering the condensing unit per hour under the conditions defined in Par. 4.

4. The capacity rating of a mechanical condensing unit shall be expressed in B.t.u./hr. and/or tons, each of 12,000 B.t.u./hr., and shall be measured under conditions defined as follows:

(a) The unit ratings shall be divided into four standard groups based on refrigerant vapor and cooling water temperatures (see Table 2, page 22).

(b) The saturated vapor temperature shall be determined by the suction pressure as measured at the suction inlet connection to the condensing unit.

(c) The standard ambient temperature for air cooled and/or water cooled condensing units shall be 90° F.

5. *The performance factor* of a mechanical condensing unit is the ratio of its capacity to its energy input, expressed in B.t.u./watt. hr. and/or tons, each of 12,000 B.t.u./hr., per kilowatt.

6. *The cooling water consumption* of a mechanical condensing unit is the total number of gallons per hour required under the conditions specified in Par. 4.

Fort Devens Heated by Gas

AYER, MASS.—The gate-house at the entrance to Fort Devens, formerly Camp Devens, has adopted gas for heating, as well as for hot water, making it an all-gas-equipped building. Gas is now used in the big barracks kitchens, where meals to feed 1,000 men three times a day are prepared both for cooking and hot water heating, replacing coal-fired boilers and coal ranges. The administration buildings, the Commandant's and Quartermaster's homes have also been equipped with gas-fired hot water heating systems.

Sells 88 Oil Burners in 50 Weeks

BOSTON—Charles Lavis, salesman for Timken Silent Automatic, out of the Boston branch, sold 88 domestic oil burners in 1934 in 50 weeks, earning over $5,000 in commissions. For the first 6 weeks he booked no orders. His eighty-eighth burner was sold during Christmas week.

Practically all of Mr. Lavis' sales were made "on his own," by cold canvassing, following up 35 form letters a day to possible prospects, coupled with telephone calls and later personal presentations. Fifty per cent of his sales were closed on the first complete presentation. On telephone calls he averaged five sales to every 100 calls.

Register Industry Asks Budget Approval

WASHINGTON—The Code Authority for the warm-air register industry made application to NRA for approval of its budget for code administration, and the proposed basis of contribution by members of the industry.

The total amount of the budget for the period from July 19, 1934 to January 10, 1935 is $2,500. The basis of contribution on an estimated sales volume of 1,000,000 for the year 1933 is ½ of 1% on the sales of that year.

COMING EVENTS

APRIL 2-3, 1935. *Convention of the National Oil Burner Dealers Association, Pennsylvania Hotel, New York, N. Y.*

APRIL 8-9, 1935. *Two-day Meeting of the American Oil Burner Association, Atlantic City, N. J.*

MAY 20-22, 1935. *Annual convention of the Heating, Piping and Air Conditioning Contractors National Association, Hotel Gibson, Cincinnati, Ohio.*

MAY 22-24, 1935. *Twenty-Second Annual Spring Convention of the American Society of Refrigerating Engineers, Hotel Statler, Detroit, Mich.*

JUNE 11-14, 1935. *Annual Convention of the National District Heating Association, Bellevue-Stratford Hotel, Philadelphia, Pa.*

OCTOBER 14-18, 1935. *Seventeenth Annual Convention of the American Gas Association, Atlantic City, N. J.*

Expects Little Gain in Home Building

WASHINGTON—Although home rentals have risen during the past year, reversing the downward course of the previous nine years, the improvement has not been sufficient, in the face of rising construction costs, to exert a marked stimulus on the volume of residential building, it is explained in an article in the January number of the Federal Home Loan Bank Review.

"Home financing institutions, shareholders, buildings and homeowners all have suffered from ignorance of national and local trends in home construction and real estate activity," the article states. "This ignorance made possible the overfinancing and overbuilding which helped bring on the depression. In reinforcing our system for financing housing, facts as to the market are essential."

The monthly publication of fundamental data, both sectional and national, will serve as an incentive to home financing institutions for the collection of more detailed local statistics, the article points out.

Testing of Drying Equipment to be Standardized

NEW YORK—A proposed practice for testing drying equipment has been completed in tentative form by the Committee on Drying, Process Division, A.S.M.E. Discussion, criticism, and comments are solicited and welcomed. Copies are available on application at the Society's headquarters.

Communications should be addressed to C. W. Thomas, Drying Committee, A.S.M.E., Process Industries Division, 29 West 39th St., New York.

Oil Burner Rental Plan Begun in Chicago

CHICAGO—An entirely new selling plan for oil conversion burners is announced by the Williams Oil-O-Matic Heating Corporation. A trial installation, with "no money down, three years to pay, removal if dissatisfied, a nominal monthly rental," will be features of this plan.

Details of the plan were announced in full-page colored advertisements in recent Chicago Sunday newspapers. The company advertised that under the trial offer the user will pay a rental for the burner as low as $8.90 a month for the home of average size. If it is decided to purchase the burner, the rent paid will apply on the purchase price, a method similar to the plan used by a number of natural gas utilities.

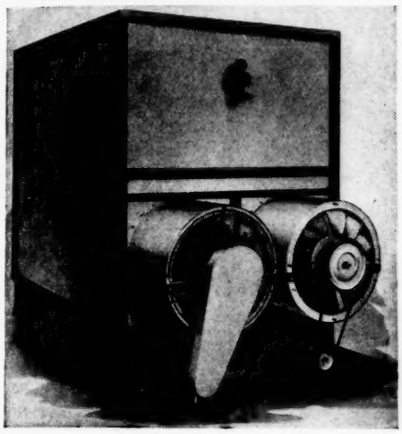
The trial offer applies only in territories where authorized dealers of the company have approved the plan in cooperation with the National Housing Act.

NEW EQUIPMENT

Binks Indoor Forced Draft Cooling Towers

The Binks Mfg. Co., 3114 Carroll Ave., Chicago, has placed on the market a complete line of indoor forced draft cooling towers. Eight sizes are available, ranging in capacity from 5 to 50 g.p.m. They are recommended for the cooling of condensing and circulating water for various types of refrigeration equipment and other industrial processes.

The tower housing is constructed of a heavy-gauge, galvanized, copper-bearing steel material, provided with interior air deflectors. The fan is of a modified design of Binks construction, made of aluminum alloy. Warm water is delivered to the tower from the condenser or other process to a system of



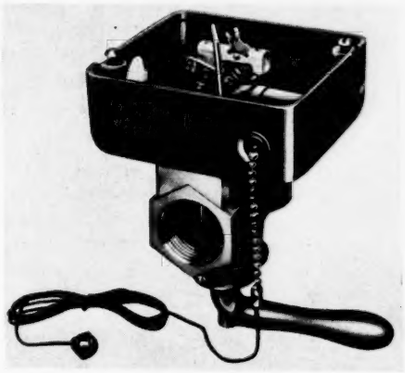
Binks cooling tower

Rotojet clog-proof nozzles, suitably arranged to provide maximum water breakup and distribution under low pressure.

The 5 and 10 g.p m. towers are furnished as self-contained units, and the larger sizes made up in sections which are conveniently assembled on the job. All sizes of towers are furnished complete with fan and fan motor, together with water circulating pump where desired. All sizes of towers can be arranged for automatic operation where necessary. The finished units present a most attractive appearance, being sprayed with two coats of aluminum protective paint.

Inland Gas Cock

A. Y. McDonald Mfg. Co., Dubuque, Iowa, and the Inland Mfg. Co., Chicago, have placed on the market the Inland automatic gas-cock switch, a lever handle gas shut-off, and summer switch for gas-fired unit heaters, boilers, furnaces, and conversion burners.



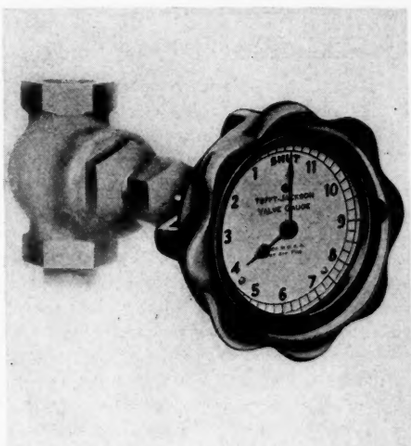
Gas cock for heating equipment

When used with a unit heater, when the gas cock is closed by the lever handle, the switch is automatically thrown on, cutting out the pilot and room thermostatic controls. The fan on the unit heater is then ready for service as an independent ventilating unit, its operation being controlled manually by a pull-chain switch. Switch is on only when gas supply is completely off.

When the gas cock is opened to turn gas on to the unit heater, the switch is automatically thrown off before any gas passes through cock, bringing pilot and room thermostats into operation for control of unit.

Tefft-Jackson Valve Position Indicator

A valve position indicator showing whether a valve is shut or how many turns open, has been placed on the market by Tefft-Jackson, Inc., 29 River St., Pawtucket, R. I. It operates by a positive gravity mechanism making it applicable to valves whose stems are in a horizontal or semi-horizontal position.



Indicator showing valve position

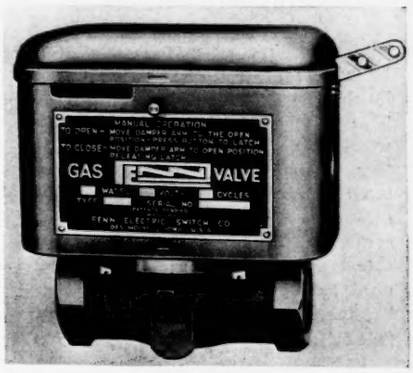
The maker states the indicator is ideal for manual control work as the same setting will give the same result each time the valve is operated. The indicator is adjustable in its own bracket which replaces the regular valve wheel, enabling resetting when the valve wears.

When the large and small hands of the indicator are at "shut" the valve is closed; when small hand is at "one" and large hand at "shut" the valve is one turn open, and so on.

A number of sizes are available and special attachment may be had for large valves, rising stem valves, and overhead chain-operated valves.

Penn Power Gas Valve

The Penn power gas valve is being built by the Penn Electric Switch Co.,



Penn gas valve

Des Moines, Iowa. The device uses a volatile liquid which, when the control calls for an open valve, is partly vaporized by means of an electric heating element surrounding the storage tank. This increase in pressure forces the remainder of the liquid into the bellows, opens the valve.

When the control cuts off the current in the heating element, the vapor is condensed, with a consequent reduction in pressure, so that the bellows contract and the valve shuts. The valve is normally held in a closed position by means of a spring.

Interruption of the current or failure of the actuating element provides positive closure and closes the valve.

Peerless Exhaust Fan Controller

The Peerless Electric Co., Warren, Ohio, has added an 8 speed, 3-tap controller to its line of exhaust fans. This device permits easy selection of any three of the eight speeds under control of the indicator type rotary switch, thus giving a speed range to meet every requirement.

Milligan & Wright Blueprint Machine

A blueprint machine which utilizes the new Angstrom blueprint lamp has been placed on the market by Milligan & Wright Co., 4644 Prospect Ave., Cleveland. The Angstrom lamp used in this machine is of the incandescent type and is said to offer many advantages over the conventional arc and mercury vapor lamps. It operates from the 110-115 d.c. or a.c. lighting circuit.

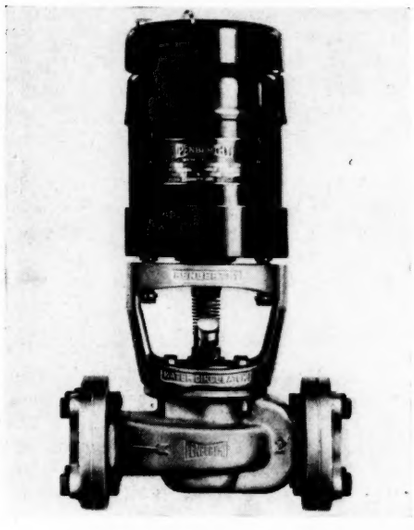
The Model 100 machine is the portable table type which will print one 18 x 24, or two 12 x 18, or four 9 x 12 prints at one time. To make a print it is only necessary to place tracing and paper on the plate glass top, lower the pressure pad and close the cover. The springs in the cover act on the pressure pad, assuring good contact between tracing and paper. The automatic time switch is turned on and set for about 1 min. exposure.

The machine is priced at $75.

Penberthy Water Circulator

The Penberthy water circulator has been placed on the market by the Penberthy Injector Co., Detroit, Mich. The device is designed to force hot water from the boiler through the system immediately when the motor is started, eliminating the de'ay in heat delivery encountered with a gravity system.

The circulator consists of a centrifugal type pump constructed of steam bronze. Moving parts are sound insulated from the circulator body by sound insulating gaskets. The impeller is of the double inlet balanced type that offers no resistance to gravity flow, while the impeller shaft is of monel metal guided in a well lubricated long bronze bearing outside the packing. The circulator body is of heavy cast bronze.



Hot water circulator

The motor is of the condenser start condenser run type, single phase 110 volts, 60 cycle, 1725 r.p.m. with no radio interference. This type motor has high starting torques with low starting currents. The motor floats on three sound insulating springs.

The circulator is available in three sizes for pipe sizes 1½, 2, and 3 in.

Rotax Humidity Controller

The Foxboro Co., Foxboro, Mass., has developed the Rotax indicating relative humidity controller. The company's membrane-type humidity recorder is combined with the Rotax-type contacts to form an electrically-operated humidity controller.

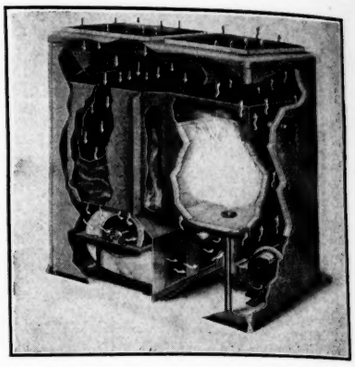
The controller can be located wherever electric current is available and maintains the desired humidity by operating solenoid valves and motor valves on water, air, or steam lines. A relay set is located inside the case. The range of the instrument is from 0 to 100% relative humidity and for use between plus 10° and plus 120°.

Humidity indicating-controller

Chicago End Suction Pump

A compact, close-coupled centrifugal pump, with capacities ranging from 100 to 600 g.p.m. against heads up to 189 ft. was recently added to the line of close-coupled pumps manufactured by the Chicago Pump Co., Chicago. This pump is designed for circulating and cooling systems, standpipe and water supply systems in buildings and for transferring and handling reasonably clear industrial liquids.

It is a single-stage, end suction unit. The pump and motor are built together with a single shaft. The enclosed type impeller is keyed to the motor shaft, which extends into pump casing. There is one moving part.



Warm air type conditioner

Scott-Newcomb Air Conditioner

Scott-Newcomb, Inc., 1922 Pine St., St. Louis, has announced an air conditioner, an oil- or gas-fired warm-air type unit.

The burner is entirely enclosed and located under the combustion chamber of the furnace. Either a vertical flame oil burner or bunsen type gas burner can be used. Products of combustion flow upward and over the rear wall and downward into the bottom of the economizer sections, of which there are six. The hot gas is passed upward in these sections to the top and back where they enter a header which connects to the flue or chimney.

The air filters, which are removable from either side of the furnace through removable panels, are located above the economizer sections. The blowers and motors are mounted on rubber cushions.

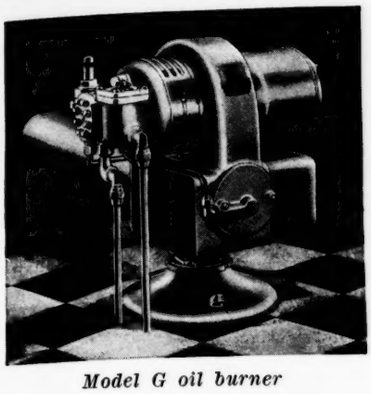
Reed Unit-Fans

Ventilation in package form is the aim of Reed Unit-Fans, Inc., 708 Girod St., New Orleans, La., which has introduced a line of propeller fans put up in such form that they can be assembled in multiple for various uses.

The unit consists of a square-bladed fan, with motor and mounting base, and louvers. The dimensions of the unit are 16 in. x 16 in. with a depth of 9 in. They are so designed that the bolting together of adjacent sides forms a unit structure suitable to mount in a given space. The structure consists of a square steel frame mounting with bent back sides, each side being provided with two bolt holes which register with similar bolt holes in adjacent units. The rear of the fan is enclosed in a wire grille held on by two nuts. Each unit has a permanently attached short connecting cord and plug.

The motors are direct connected, fully enclosed, shaded pole type, with wool yarn packed bearings. The motor fan assembly is rubber mounted.

It is claimed that these units are particularly dependable for attic, window, or space ventilation, in addition to being useful for portable application.



Model G oil burner

Bettendorf Small Pressure Burner

The Micro Corp., Bettendorf, Iowa, has announced the Model G, a small oil burner of high-pressure type. It is equipped with a standard ⅛-hp. split phase motor, has a capacity of 1.35 to 2.5 gal. of No. 3 oil per hr., and is built for homes up to 750 sq. ft. of steam radiation.

MHR Slow Opening Gas Valves

Minneapolis-Honeywell Regulator Co., Minneapolis, has developed a line of slow opening gas valves. They are sturdily constructed and employ a similar power unit which has been in general use for a number of years on other types of MHR valve and motor equipment.

The time of opening is approximately 30 sec. and for closing approximately 3 sec. The motor operates the valve through the opening cycle and a 50-lb. external spring in holder located alongside of adapter rotates motor backwards to close the valve.

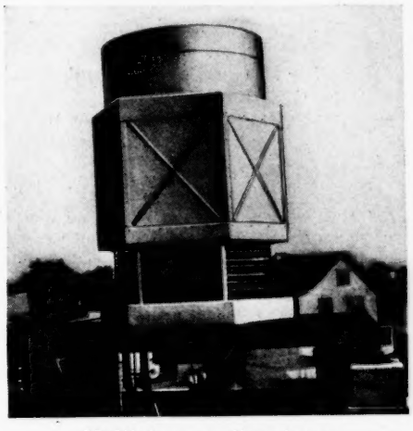
The adapter includes an adjustable flare pilot with bypass adjustment for on-off or low-high-low service. The flare pilot valve always opens prior to opening of main gas valve and closes (or adjusts its flame from high to low) after main valve opens. This same action takes place on the closing cycle. Provision is made for separate gas inlet to flare pilot valve from piping ahead of the gas valve if pilot flame has tendency to be smaller than is practical when main valve opens.

Valve sizes 1½, 2, 2½, and 3 in. are straight through screwed type with bronze bodies, 3, 4, and 6 in. sizes are straight through, flanged type with iron bodies. All sizes are of the relief type with small integrally built valve in top of main valve. Relief valve opens ahead of main valve, allowing pressure to be relieved or built up on both sides of the valve so that higher pressures can be handled with minimum amount of effort. The valves carry a 3-lb. pressure rating up to and including 3 in. size and 1 lb. rating for 4 to 6 in. sizes.

Amirglass Filters

Amirton Co., Inc., 49-53 East 21 St., New York, is marketing a line of automatic or manual cleaning type air filters under the trade name Amirglass. The filter medium is of fine spun g'ass in which long fibers are matted to prevent settling or the formation of air pockets.

The filters are made in either flat or sawtooth style. The former is available in two sizes, 16 × 25 and 20 × 20 in., both ¼ in. thick, and both having a capacity of 800 c.f.m. The saw-tooth type is made in the same areas but is available in three thicknesses for each area— 1⅞, 3, and 6 in. and with capacities of 1000, 1500, and 2000 c.f.m., respectively. Supporting frames are made of copper, galvanized steel, or steel painted with nitrose, and so designed that they can be bolted together in multiple. Automatic cleaning of the cells is possible by the use of sprays placed in front of the cell.



Multistage cooling tower

Coey Cooling Tower

A new type cooling tower has been brought out by Research Corp., Chrysler Building, New York. It is known as the Coey Multistage cooling tower.

The tower is designed to operate efficiently over a wide temperature range. At the same time the size and weight of the tower are lessened and the spray loss is reduced to a point where the operation is invisible except on days so cold that one can see a man's breath.

Water to be cooled is introduced through a trough at the top, in which it is equally distributed around the tower by an overflow weir and from which it trickles down over a series of wood baffles. Air entering at the bottom passes through this water three times before being exhausted at the top. It is claimed that this multistage circulation gives the air a long travel in a short tower; secures thorough, uniform contact between air and water, and reduces fan power consumption.

Ric-wiL Super-Strength Tile Conduit

A tile conduit called Super-Strength has been put on the market by the Ric-wiL Co., Cleveland, Ohio. This conduit is designed for use under highways or where heavy traffic conditions prevail, except railway traffic. The tile sections of conduit have extra heavy walls with special reinforcing at top, bottom, and sides.

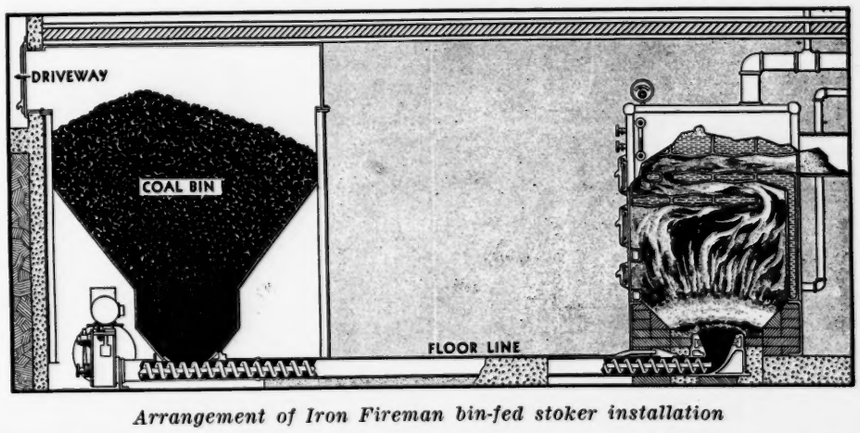
Laboratory tests indicate sufficient strength to support a concentrated static 6-ton traffic load per wheel under installation conditions.

The sections come in 2-ft. lengths for all diameters except 26 in., which is 2 ft. 6 in. in length. Regular features of the Ric-wiL system are maintained in the design. Different types of insulation are optional.

Bin-Fed Iron Fireman Stoker

Iron Fireman Manufacturing Co., Portland, Ore., is making installations of a bin-fed model stoker. Coal is conveyed slowly by a revolving feed worm from the bin to the retort, which is directly beneath the fuel bed.

The bin-fed models are available to fit practically every type of heating plant or basement arrangement. Coal can be conveyed to the heater from the front, rear, either side, or at an angle.



Arrangement of Iron Fireman bin-fed stoker installation

Bailey Boiler Meter for Industrial Service

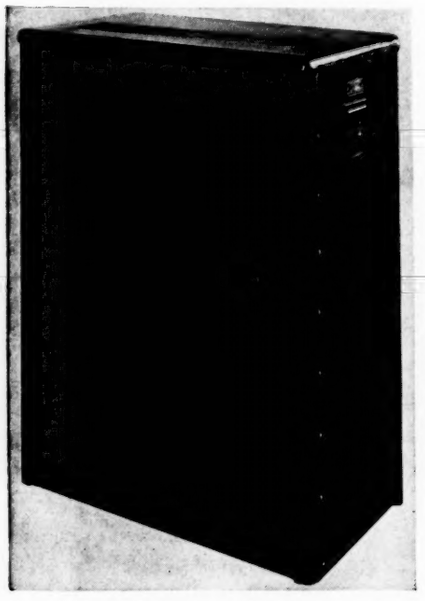
Bailey Meter Co., Cleveland, Ohio, has developed a steam flow-air flow boiler meter for industrial service. This meter records steam flow from the boiler, air flow supplied for combustion and flue gas temperature—all on one 12-in. diameter uniformly graduated chart. It also indicates steam flow on a porcelain enameled scale and integrates the total steam flow on a 6-digit counter which reads like an automobile mileage register.

In operation, the meter is an easily understood combustion guide. It is necessary only for the operator to adjust the boiler damper or fuel control until the records of steam flow and air flow coincide, one upon the other, on the meter chart. When this condition exists he knows that the boiler is being operated economically.

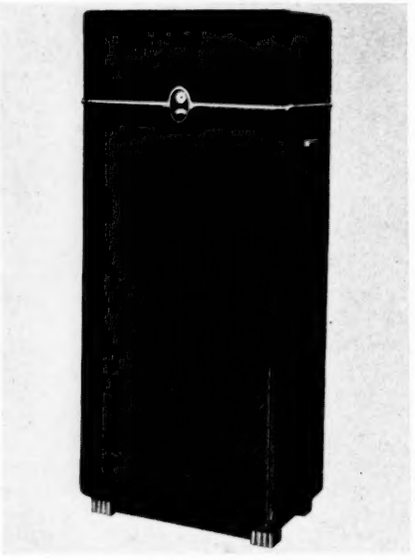
Kauffman Type F Room Conditioner

Kauffman Air Conditioning Corp., 4485 Olive St., St. Louis, is manufacturing the type F room air conditioner. This unit has a cooling capacity of ½ ton with air delivery of 300 c.f.m. A ½-hp. motor drives the mechanical compressor. The unit weighs 400 lb. and is 29 in. long, 15 in. wide, and 34 in. high. Twenty-five feet of rubber tubing for connection to the faucet and a 10-ft. extension are supplied. The cabinet is of furniture steel finished in burl walnut.

The company also makes Type I, a similar unit with a cooling capacity of 1 ton and air delivery of 600 c.f.m. The unit has a 1-hp. motor and is 35 in. long, 16½ in. wide, and 42 in. high.



Type F room conditioner



Model 255 gas boiler

Bryant No. 255 Boiler

The Bryant Heater Co., 17825 St. Clair Ave., Cleveland, has recently placed on the market its new Model 255 boiler for small homes and which sells for $255. It is housed in a cabinet approximately the size of a four-drawer letter-file, finished in deep blue with chromium trim.

The boiler is of cast iron with vertical tubular sections and with ribs and fins on the inside of the firebox to give maximum heating surface. The jacket is asbestos insulated.

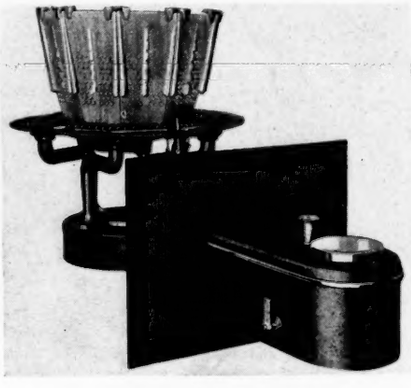
Bryant Gas Conversion Burner

The Bryant Heater Co., 17825 St. Clair Ave., Cleveland, is marketing its 1935 Bryant gas conversion burner, available in sizes to meet every shape and size of firebox of domestic heating plants.

Features include a combustion shield which prevents rising air currents of secondary air from deflecting the scrubbing action of the air against the heater wall. Each shield is cut on the job to insure a close fit. A shield for replacing the ashpit door, and which improves the appearance of the installation as well as making an air-tight joint, is also provided.

The controls are used in the cabinet extending from the firepot. Primary air, pilot light, and gas flow are all regulated from this cabinet.

A dual air control is used which enables adjustment of both primary and secondary air from the outside.



Bryant gas burner

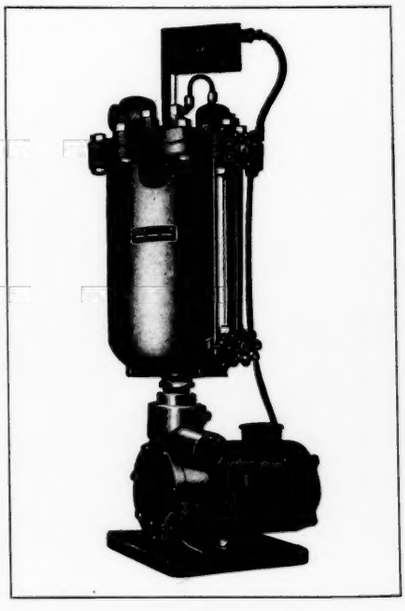
Johnson Electrap

The Johnson Corp., Three Rivers, Mich., announces the Johnson Electrap, a pressure-equalizing, motor-driven boiler feed and condensate return unit, requiring only a 1/3-hp. motor for the 100-hp., 125-lb. pressure unit. The Electrap is a combination of the Johnson two valve return trap and a motor-driven low-head centrifugal pump.

In operation, when the condensate fills the trap, the trap valves are actuated, the vent valve closes, and the steam valve opens, admitting steam at boiler pressure. At the same time the mercury switch is tripped, starting the motor pump. As the pressure in the trap is equalized with that in the boiler the pump has only to raise the water to the boiler and overcome pipe friction, so that only a small motor is required. When the trap has emptied the trap valves are again actuated, the steam valve closed, the vent valve opened, and the motor stopped.

As the unit may be set at or below the boiler level it is especially suitable for gravity systems and will return both high and low-pressure returns.

The unit will continue to handle return condensate when boiler pressure is dropped to zero. It is offered in four sizes for boilers of 20, 40, 60, and 100 hp. and in two series, 60 and 125 lb. maximum pressure.



Johnson Electrap

King Conditioning Equipment

King Ventilating Co., Owatonna, Minn., is marketing a line of conditioning and heating equipment.

The company's apparatus includes a chromium-plated two-speed suspended type unit heater with nickel steel header and copper tubes with copper fins. The frame is of aluminum and the motor rubber-mounted. This unit is made in six sizes with a B.t.u. delivery of 25,000 to 245,000 B.t.u. per hr., with 2 lb. steam pressure and 60° entering air.

The company also makes a floor type unit cooler in three sizes with capacities of ½, 3, and 4½ tons of refrigeration.

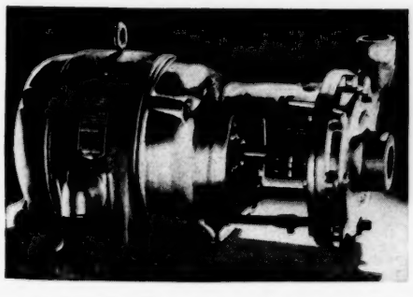
The company also builds an air washer in both a floor and suspended type which can be used in connection with ice or a refrigerating machine for cooling. When so used, the capacities of the upright units are ¾ and 1½ tons, depending on the size, and 1½, 3, or 5 tons for the suspended units.

Fairbanks, Morse Motor-Pump Unit

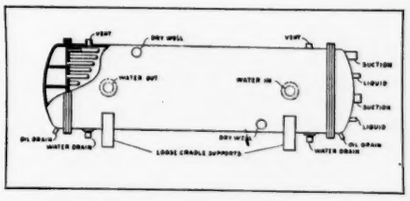
Built together to conserve space, facilitate installation, reduce weight and maintenance, a motor-pump unit has been developed by Fairbanks, Morse & Co., Chicago.

The unit consists of a centrifugal side-suction pump with a closed bronze impeller mounted directly on the shaft of a ball-bearing splash-proof motor. The shaft runs in two ball bearings which require lubrication once or twice a year. The unit may be placed in any position and at any angle to fit the application.

The units are available in capacities from 10 to 250 g.p.m. and for heads up to 190 ft. with motors rated from ¾ hp. to 10 hp. to meet the requirements of a wide range of applications. They are suited for service in buildings, industrial plants, public utilities, etc., and as built-in units on assembled equipment such as air conditioning units and other such equipment where a compact pumping unit is required.



Centrifugal motor-pump unit



Elevation, shell-and-tube cooler

Filtrine Shell-and-Tube Cooler

Filtrine Manufacturing Co., 51-53 Lexington Ave., Brooklyn, N. Y., has introduced a shell-and-tube cooler for use in connection with air conditioning and industrial applications. The coolers are made in capacities ranging from 1 to 50 tons of refrigeration for use with one to four condensing units using either methyl or freon refrigerant.

The unit consists of a steel shell with bolted flanged steel heads, supported in a horizontal position by two cradle supports. The evaporator consists of 1-in. steel tubes with ends rolled to the full depth of double grooved steel tube sheets. To prevent channeling of water and to obtain maximum heat transfer, closely spaced circular orifice type baffles are used. Water pressure drop varies from 1 to 2-lb. depending on water volume.

Refrigerant liquid and suction connections are at one end, separated by one or more partitions in the head, depending on the number of condensing units used. Two dry wells for thermostat bulbs provide for dual temperature control. Large size flanged water connections can be bushed to suitable size on the job. Refrigerant pressure drop will not exceed ½-lb.

American Brass Wrought Copper Solder Fittings

Supplementing its line of Anaconda cast bronze solder and flared type fittings and valves for assembling copper water tubes, The American Brass Co., Waterbury, Conn., now offers Anaconda wrought copper fittings, elbows, tees, couplings and unions, including a complete range of reduction and adapter combinations in sizes from ⅜ to 2 in., inclusive.

Arrangements have been made to have jobbers handling Anaconda products carry adequate stocks of these fittings.

Detroit Fan and Limit Switch

No. 253 and 243, combination fan and limit switches, have been announced by the Detroit Lubricator Co., Detroit. The 243 is similar to the 253 except that the former has a long shank for installations where the thermostatic element is to be located deeper in the bonnet. These instruments combine a high-voltage fan control and high-voltage furnace limit switch, both of the two-wire type.

The fan switch is arranged to make a circuit on temperature increase to start the fan producing the circulation of air through ducts when temperature of predetermined setting is reached. The limit switch breaks circuit on temperature increase stopping oil burner or stoker, or closing gas valve when the desired bonnet temperature is reached. It is normally installed in the bonnet of furnace or in the plenum chamber.

Both fan and limit switches can be furnished for high voltage, but this combination control can also be provided with binding posts for low voltage on either the fan or the limit switch or both. Therefore, both switches may be for high voltage, one for high and the other for low voltage, or both for low voltage.

Worthington Two-Stage Centrifugal Pump

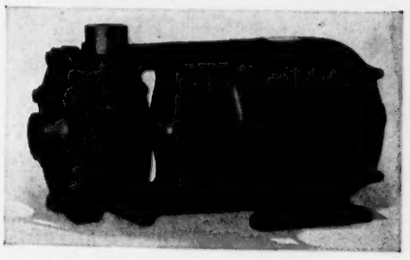
An advanced development of its two-stage Monobloc centrifugal pump is announced by the Worthington Pump & Machinery Corp., Harrison, N. J. The unit has low power requirements and is simple in design. It is applicable to all services requiring small capacity and medium discharge head.

The casing, designed for 150 lb. pressure, is bolted directly to the motor frame without an intermediate distance piece, thus eliminating the necessity for a baseplate.

The impeller is a unit construction, consisting of two enclosed type impellers cast back-to-back, so that the overhung weight is actually no greater than that on a single stage pump. The impeller, which is keyed, is held firmly to the shaft by an impeller nut and the shaft sleeve, also keyed, is a separate, renewable part.

The motor has oversize grease lubricated ball bearings. The impeller is mounted directly on the motor shaft and uses no coupling.

The pump has steep head capacity characteristics and is intended for air conditioning installations, refrigeration service, boiler return, and process work. It can be mounted vertically or horizontally.



Monobloc motor-pump unit

Degree-Days and Unit Fuel Consumption—December, 1934

Continuing HEATING AND VENTILATING's seventh year of publishing degree-day data for various large cities in the United States

	Atlanta	Baltimore	Birmingham	Boston	Buffalo	Chicago	Cincinnati	Cleveland
Degree-days for December, 1934	733	844	626	1135	1168	1202	980	1053
Degree-days, Sept. 1, 1934 to Dec. 31, '34	1135	1535	942	2246	2344	2155	1746	1998
Degree-days, Sept. 1, 1933 to Dec. 31, '33	901	1668	672	2423	2640	2284	1825	2153
Degree-days, Sept. 1 to Dec. 31, Normal	1131	1664	913	2130	2371	2225	1784	2185
Lb. coal per sq. ft. rad., December, 1934	5.864	6.752	5.008	9.080	9.344	9.616	7.840	8.424
Gal. oil per sq. ft. rad., December, 1934	0.503	0.579	0.429	0.778	0.801	0.824	0.672	0.722
Cu. ft. gas per sq. ft. rad., December, '34	70.37	81.02	60.10	108.96	112.13	115 39	94.08	101.09

	Davenport	Denver	Des Moines	Detroit	Duluth	El Paso	Fort Wayne	Grand Rapids
Degree-days for December, 1934	1286	897	1306	1211	1687	510	1192	1198
Degree-days, Sept. 1, 1934 to Dec. 31, '34	2221	1928	2361	1850	3524	817	2229	2307
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2312	1508	2365	2422	3912	754	2356	2580
Degree-days, Sept. 1 to Dec. 31, Normal	2333	2276	2370	2332	3434	1038	2220	2397
Lb. coal per sq. ft. rad., December, 1934	10.288	7.176	10.448	9.688	13.496	4.080	9.536	9.584
Gal. oil per sq. ft. rad., December, 1934	0.882	0.615	0 896	0.830	1.157	0.350	0.817	0.821
Cu. ft. gas per sq. ft. rad , December, '34	123.46	86.11	125.38	116.26	161.95	48.96	114.43	115.01

	Harrisburg	Hartford	Indianapolis	Kansas City	La Crosse	Los Angeles	Louisville	Memphis
Degree-days for December, 1934	981	1097	1082	1053	1471	146	894	694
Degree-days, Sept. 1, 1934 to Dec. 31, '34	1890	2182	1931	1786	2754	287	1531	1038
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2141	2473	1988	1592	2911	423	1574	963
Degree-days, Sept. 1 to Dec. 31, Normal	1981	2157	2002	1809	2778	424	1587	1127
Lb. coal per sq. ft. rad., December, 1934	7.848	8.776	8.656	8.424	11.77	1.168	7.152	5.552
Gal. oil per sq. ft. rad., December, 1934	0.673	0.752	0.742	0.722	1 009	0.100	0.613	0.476
Cu. ft. gas per sq. ft. rad , December, '34	94.18	105.31	103.87	101.09	141.22	14.02	85.82	66.62

	Milwaukee	Minneapolis	New Haven	New Orleans	New York	Omaha	Peoria	Philadelphia
Degree-days for December, 1934	1257	1551	1049	299	979	1231	1207	902
Degree-days, Sept. 1, 1934 to Dec. 31, '34	2398	2938	2045	376	1850	2188	2133	1623
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2585	3127	2287	193	2011	2124	2203	1766
Degree-days, Sept. 1 to Dec. 31, Normal	2601	2941	2109	403	1849	2284	2323	1733
Lb. coal per sq. ft. rad., December, 1934	10.056	12.408	8.392	2.392	7.832	9 848	9.656	7.216
Gal. oil per sq. ft. rad., December, 1934	0.686	1.064	0.719	0.205	0.671	0.844	0 828	0 619
Cu. ft. gas per sq. ft. rad , December, '34	120.67	148.90	100.70	28.70	93.98	118.18	115.87	86 59

	Pittsburgh	Portland, Ore.	Providence	Reading	Rochester	St. Louis	Salt Lake City	San Francisco
Degree-days for December, 1934	995	648	1089	981	1183	983	983	375
Degree-days, Sept. 1, 1934 to Dec. 31, '34	1906	1448	2159	1856	2337	1600	2031	775
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2051	1534	2383	1989	2622	1601	1683	864
Degree-days, Sept. 1 to Dec. 31, Normal	1949	1724	2129	2014	2414	1738	2149	949
Lb. coal per sq. ft. rad., December, 1934	7.960	5.184	8.712	7.848	9.464	7.864	7.864	3.000
Gal. oil per sq. ft. rad., December, 1934	0.682	0.444	0.747	0.673	0.811	0.674	0.674	0.257
Cu. ft. gas per sq. ft. rad , December, '34	95.52	62.21	104.54	94.18	113.57	94.37	94.37	36.00

	Scranton	Seattle	Spokane	Syracuse	Toledo	Trenton	Washington, D. C.	Wichita
Degree-days for December, 1934	1109	651	994	1209	1164	984	855	944
Degree-days, Sept. 1, 1934 to Dec. 31, '34	2225	1587	2325	2348	2201	1879	1599	1585
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2481	1729	2284	2688	2369	2102	1709	1387
Degree-days, Sept. 1 to Dec. 31, Normal	2274	1881	2583	2491	2189	1760	1741	1783
Lb. coal per sq. ft. rad., December, 1934	8.872	5.208	7.952	9.672	9 312	7.872	6.840	7.552
Gal. oil per sq. ft. rad., December, 1934	0.760	0.446	0.682	0.829	0.798	0.675	0.586	0.647
Cu. ft. gas per sq. ft. rad , December, '34	106.46	62.50	95.42	116.06	111.74	94.46	82.08	90.62

Fuel consumption figures given above are based on certain conditions, and for other conditions corrections must be made. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operating at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal, 1000 B.t.u. per cu. ft. for gas, and 140,000 B.t.u. per gal. for oil. To correct for other heating values, efficiencies, and design conditions, follow the method explained in the "Heating and Ventilating Degree-Day Handbook."

Pipe maintenance costs go down!

When NATIONAL Copper-Steel Pipe is adopted for soil, waste and vent lines, rain leaders, and steam returns in office buildings, factories or residences, maintenance costs go down. This fact is being turned to account more and more every year as those responsible realize that it is especially in these lines that atmospheric corrosion or alternate wetting and drying conditions prevail. They know that pipe weakened by corrosion must be replaced.

Over twenty years of service tests have proved that copper-bearing steel has a special resistance to this type of corrosion. Therefore, Copper-Steel Pipe lasts longer and economy is found in its use.

There is no drawback in cost—just a trifle above regular steel pipe; and the durability it affords is unsurpassed by any ferrous metal except the stainless alloys. Begin now to use NATIONAL Copper-Steel Rust-Resisting Pipe, and keep pipe costs down. Descriptive literature sent upon request.

Look For The Green Color! National Copper-Steel Pipe is marked as follows: Black Pipe—Smaller sizes colored green. Larger sizes, two green stripes running lengthwise. Galvanized Pipe—All sizes, two green stripes running lengthwise.

NATIONAL TUBE COMPANY • Pittsburgh, Pa.

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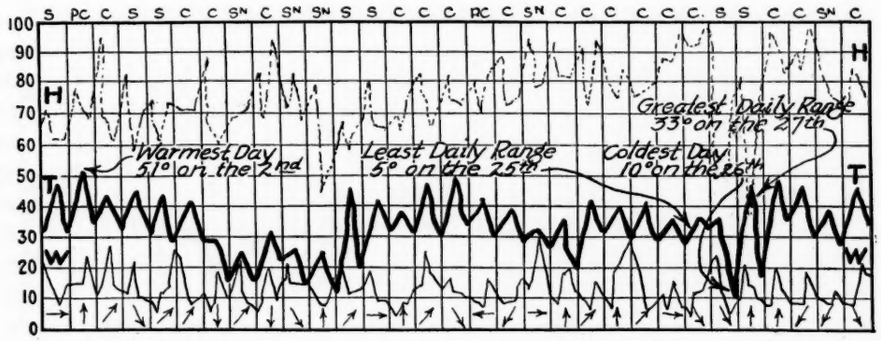
Export Distributors—UNITED STATES STEEL PRODUCTS CO., New York, N. Y.

United States Steel Corporation Subsidiary

NATIONAL COPPER-STEEL RUST-RESISTING PIPE

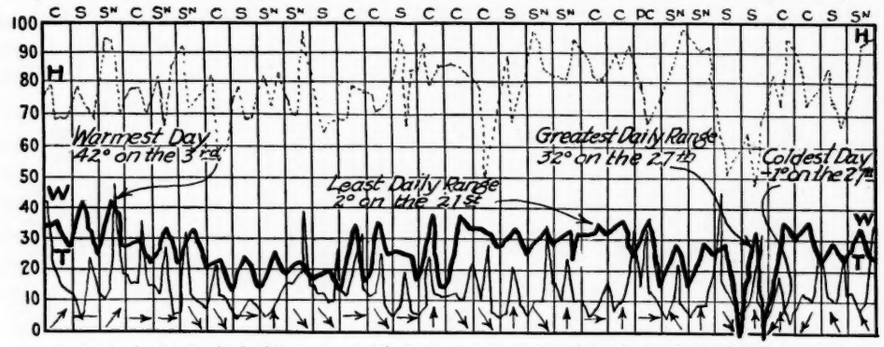
THE WEATHER FOR DECEMBER, 1934

Plotted from records especially compiled for HEATING AND VENTILATING by the U. S. Weather Bureau. Heavy curves (T), temperatures in deg. F.; dotted lines (H), per cent relative humidity, from readings at 8 a.m., noon, and 8 p.m., except for New York, which shows hourly readings. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions. S—clear; PC—partly cloudy; C—cloudy; R—rain, Sn—snow.



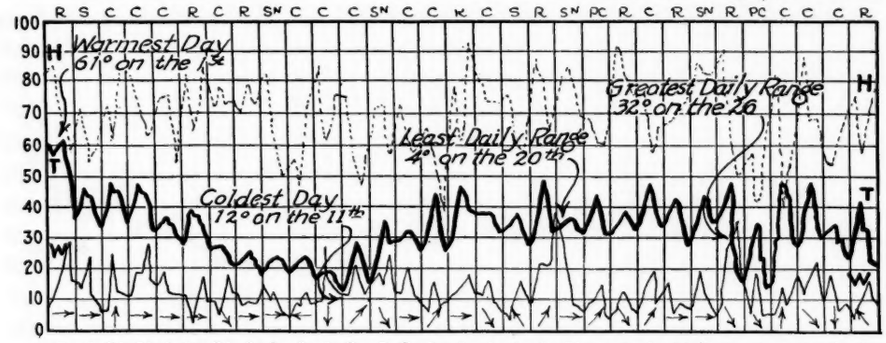
St. Louis

Mean temp. for month, 33.4°; aver. wind velocity, 11.9 m.p.h.; prevailing direction of wind, S.



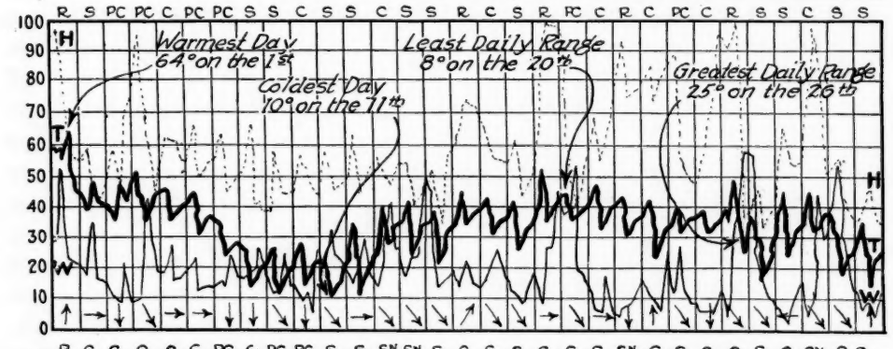
Chicago

Mean temp. for month, 26.2°; aver. wind velocity, 10.9 m.p.h.; prevailing direction of wind, W.



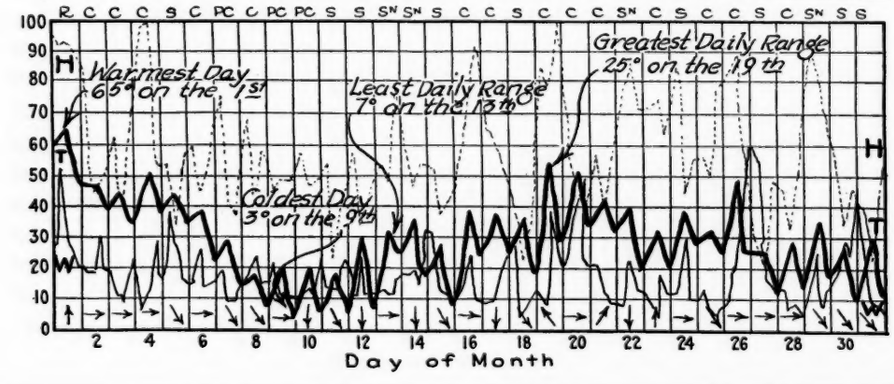
Pittsburgh

Mean temp. for month, 32.9°; aver. wind velocity, 11.2 m.p.h.; prevailing direction of wind, W.



New York

Mean temp. for month, 33.4°; aver. wind velocity, 17.0 m.p.h.; prevailing direction of wind, N.W.


Warmest Day 65° on the 1st
Coldest Day 3° on the 9th
Least Daily Range 7° on the 13th
Greatest Daily Range 25° on the 19th
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Boston

Mean temp. for month, 28.4°; aver. wind velocity, 15.9 m.p.h.; prevailing direction of wind, N.W.

THE GUIDE 1935
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▪ ▪
AIR CONDITIONING
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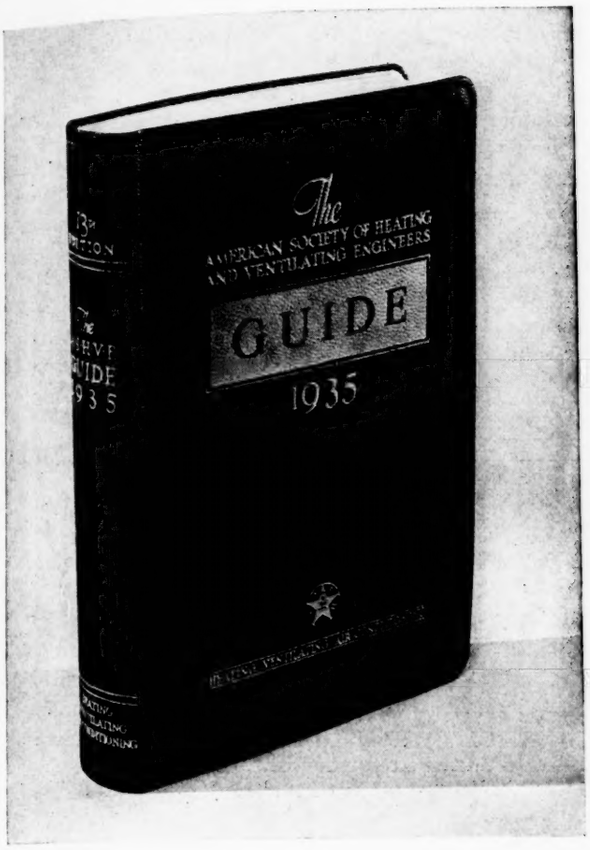

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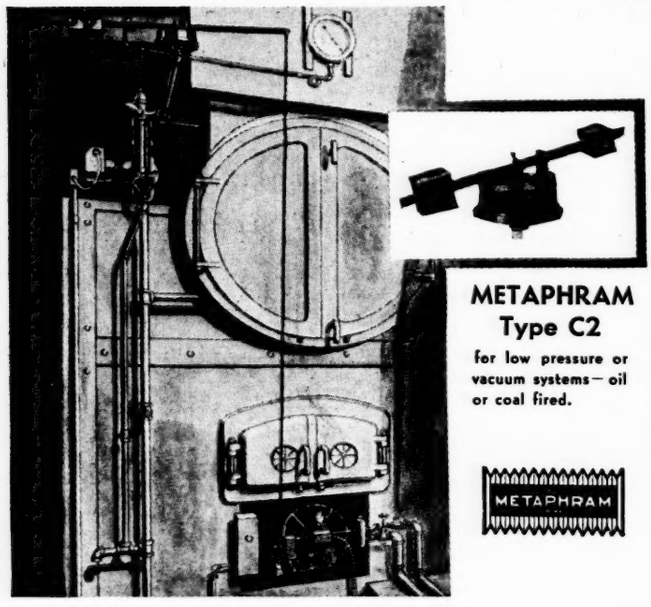

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Apartment Houses ARE an Opportunity for Modernizing

(Concluded from page 41)

interest as they do the lobby. The fact that 24-hr. heating is available is also a point valued both by tenants and those looking for apartments. The management is sure that in several cases the appearance of the boiler room has been a powerful factor in the decision of tenants to take space. At present the house has an occupancy of over 95%. This in the face of depressed conditions and a substantial rental rate which limits sharply the number of prospective tenants.

On the side of operating expense, fuel costs have been materially lowered. While the modernized plant has not been operated through a full year, records gathered already are indicative of what may be expected. No 4 oil costs about 5 cents per gallon while No. 6 has been available at from 3 cents to 4 cents. Since the new plant has been in operation the lower priced fuel is used exclusively.

It is evident that in this house a decided operating saving has been made at reasonable expenditures. At the same time the owners have a means of attracting new tenants and of holding old ones.

There are thousands of similar cases waiting for someone to dig them up. In spite of their bad name, and any impression you may have had to the contrary, apartment houses as a class are one of the best sources of modernizing work—and they should become more and more so during the course of the year. Don't overlook the apartment house when you are looking for modernizing.

Modernizing Continues with FHA and HOLC Both Backing Campaigns

(Concluded from page 45)

Farm Modernization

A total of more than one-half billion dollars was needed, as of the close of the year 1934, for repairing, modernizing, and replacing farm houses alone, according to FHA statistics. This aggregate, $576,687,000, includes only the amount needed for farm dwellings. No consideration is given to the requirements for barns, outbuildings, or other permanent farm equipment, in arriving at the total.

These figures are the result of a survey conducted by the Bureau of Home Economics, Department of Agriculture, during which 352 counties in 46 states were canvassed. To this total the estimated needs of the two states omitted (New York and Pennsylvania) were added. To insure accuracy the reports of the workers were first checked in the counties, then in the states, and finally at Washington. This work took eight months' time, and is thought to be accurate within 1%.

As might be anticipated, the southeastern rural area shows the greatest need. In this division, the sum necessary for restoration and building amounts to $186 million.

The wheat and corn belts followed the southeast closely in point of building and repair requirements.

Here the total money necessary reached a figure of $108 million. It was noted during the survey that in this section the farm houses were, on an average, considerably older than elsewhere, and consequently there was a high rate of modernization requirement.

With the operation of FHA's plan of insured mortgages making money available for farm construction, and the modernization plan in operation to aid in repair and renovizing, it may be anticipated that the current year's building total will be augmented by construction in the rural sections.

This is further indicated by the report made public recently by Louis H. Bean, economic advisor in the AAA, who revealed that a gain of 50% in the farmer's purchasing power was shown in 1934 over the prior year.

Moffett May Resign

James A. Moffett, FHA Administrator, has again expressed to administration leaders a desire to resign as soon as organization work on the privately-financed housing campaign is finished, probably in mid-spring. Meanwhile the Senate voted *viva voce* January 21 to notify President Roosevelt of its approval of Mr. Moffett's *ad interim* appointment as Administrator, an action which will almost certainly block Senator Long's announced intention to obtain reconsideration of the nomination.

A former Standard Oil executive, Mr. Moffett has played an active part in the recent attempt to induce industry to take a lead in the recovery drive.

Mr. Moffett has told persons high in the administration that he believes he should devote himself again to private business, but it is reported that his failure to obtain concentration by the administration on his type of housing effort, as contrasted with publicly financed low-cost housing, is behind his desire to leave the government.

NEW CATALOGS

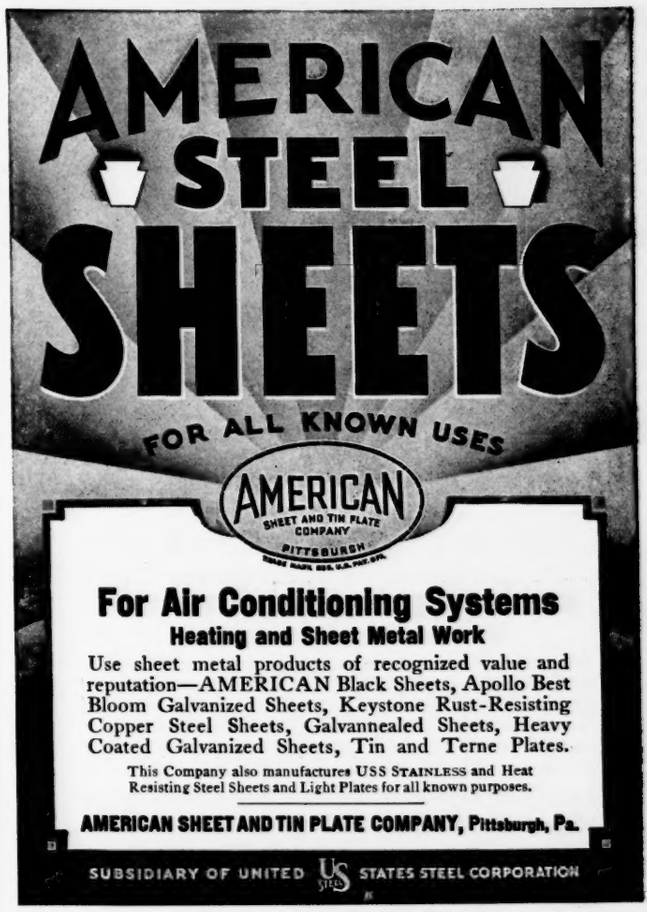
(Unless otherwise indicated, the publishers of catalogs will supply copies on request without charge.)

Automatic Products Co., 121 North Broadway, Milwaukee, Wis. A condensed catalog showing all of the standard automatic controls which the company manufactures. Gives complete information on the company's instruments. Fully illustrated, and gives complete specifications as to catalog numbers and list prices.

Bell and Gossett Co., 3000 Wallace St., Chicago. Catalog and manual, loose-leaf, describing the operation of B & G water heating systems. Illustrated with installation diagrams, piping layouts, capacity charts, and other information. It is a handy reference for all phases of domestic water heating and hot water circulation control.

The Binks Mfg. Co., 3114 Carroll Ave., Chicago. Descriptions, prices, and illustrations of spray guns for finishing, cleaning, and oiling, cup-type containers, pressure containers, oil-and-water extractors, hose, air regulators, nozzles, compressors, portable spray outfits, spray booths, and exhaust units appear in a new 32-page two-color booklet.

Cork Insulation Co., Inc., 155 East 44th St., New York. Bulletin 341, a standard-size, two-page bulletin describing Corinco isolation corkboard for the control of noise and vibration. The folder gives data on the deformation in inches under various loads for the three densities of corkboard available and shows typical application.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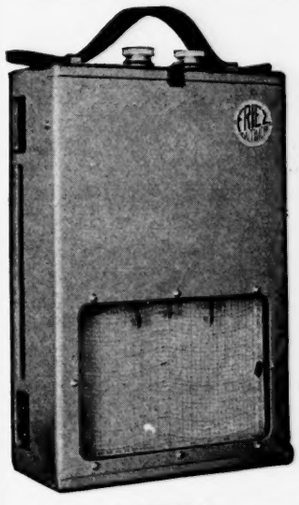

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Crane Co., Premier Heater Div., La Porte, Ind. A standard size 20-page catalog describing the company's Basmor gas-fired boiler. The book is designed for architects and engineers and, in addition to thoroughly describing and illustrating the company's line of boilers and accessories, outlines a method of heating, a method of estimating cost of gas heating, and other data. Dimensional capacity and other data relative to the boiler itself are included.

The company is also describing, in a 16-page standard size catalog, its line of gas-fired automatic gas water heaters. This catalog includes an easy method of figuring large volume water heater requirements and methods of estimating heating cost of heating water by gas.

The Fairbanks Co., 393 Lafayette St., New York. A six-page folder describing the Fairbanks renewable gate valves for which it is claimed that renewal of the seat ring can be made by one man in 5 min. Folder includes sizes, dimensions, and price data together with instructions on renewing.

Julien P. Friez & Sons, Inc., Baltimore, Md., has issued Bulletins K, L, M, and S—all standard-sized, looseleaf-punched, illustrated catalogs. The first describes the company's air conditioning products, including humidistats, thermostats, relays, humidity and temperature indicators. The second covers the company's room thermometers, including pocket-type thermometers for engineers and test and research temperature indicating devices. The third is devoted to Friez Red-Top thermo-regulators and relays for use in connection with them. The last describes and illustrates the company's sling psychrometers, aspirating psychrometers, hygrographs, and hygro-thermographs.

Gar Wood Industries, Inc., 7924 Riopelle St., Detroit, Mich. A 15-page booklet of heating data for layout, design, checking, and installation of heating and oil-burning equipment. Booklet also contains information and capacity tables of heating apparatus manufactured by Gar Wood Industries.

The Hays Corporation, Michigan City, Ind. Bulletin No. 2018. Standard size, describing and illustrating the company's Draftrol gauges, indicating draft gauges of the pointer type with a draft controller.

The Insulite Co., Minneapolis, Minn., has prepared an excellent booklet illustrating the savings in fuel resulting from the use of insulation, storm sashes, and weatherstripping. For purpose of illustration, a residence which will provide acceptable standards of living at a minimum cost for a family of four was designed. A basic estimate of costs was made assuming that the house was located in a typical city in the northern climatic zone. Amount of heat loss and fuel consumption per season for coal, oil, and gas have been determined for the house with different amounts of insulation and with and without storm sashes and weatherstripping. Figures of heat loss and fuel consumption, are worked out for the four climatic zones. Standard size, 6 pages.

Kelvinator Corp., Detroit. A 20-page book on Kelvinator air conditioning, with information for architects, engineers, contractors, manufacturers merchants, and homeowners. This book answers the question: What is air conditioning and how does it work? The book contains numerous illustrations and plan drawings showing applications for hotels, stores, homes, apartments, theaters, and offices. Standard size.

The Peerless Electric Co., Warren, Ohio. Bulletin No. 203. A 7-page, standard-size folder on the company's air conditioning equipment and controls. Covers dimensional and capacity data of Peerless blower filter units and washer filter units. The company has also issued Bulletin No. 204, also standard size, describing its line of exhaust fans. 4 pages.

Tube-Turns, Inc., Herald-Post Building, Louisville, Ky. A quick reference chart which provides an easy method of designing expansion loops, using Tube-Turns and straight lengths of pipe or tubing. This chart, based on the most modern bending theory, enables the engineer, without going into involved calculations, quickly to lay out loops that will meet almost any space requirement.

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